Leisure Luxuries and the Labor Supply of Young Men*

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Abstract

We explore the declining market hours of men in the last fifteen years, with a particular focus on less-educated young men (LEYM), who experienced a relatively large decline in work hours. The paper documents the decline in hours worked as well as corresponding trends in real wages and consumption, and shows that the large decline in hours is inconsistent with a stable labor supply curve with standard elasticities. We propose a new methodology that exploits detailed micro data on how individuals allocate their time away from work to infer how changes in leisure technology have altered labor supply. In particular, we use estimated "Leisure Engel Curves" to calculate that changes in leisure technology for computer goods broadly, and video games in particular, shift the labor supply curve by an amount between 10 and 25 percent of the observed decline in market work hours for prime age men and between 20 and 45 percent of the decline in market work hours for LEYM.

1 Introduction

Between 2000 and 2015, hours worked for prime-age men (PAM) aged 21 to 55 fell by just over 10 percent. The decline in work hours was even more pronounced for less educated young men (LEYM). During the 2000s, men between the ages of 21 and 30 with less than a bachelor's degree experienced a 20 percent decline in market work hours. These declines started prior to the Great Recession, accelerated sharply during the recession, and have

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barely rebounded since its end. During that time, both prime-age men and less-educated young men experienced roughly a 10 percent decline in real wages.[1]

In this paper, we explore the decline in work hours for young men since 2000. Using standard parameterizations, we show that the decline in hours for LEYM (both in absolutely and relative to all prime-age men) is inconsistent with a stable labor supply curve. We propose a new methodology that exploits detailed micro data on how individuals allocate their time away from work to infer how changes in leisure technology have altered labor supply. We find that changes in leisure technology for computer goods broadly, and video games in particular, shifted in the labor supply curve for LEYM by an amount between 10 and 25 percent of the observed decline in market work hours for prime age men and between 20 and 45 percent of the decline in market work hours for LEYM.

The paper consists of three parts. In the first part we explore in detail the changes in work hours, wages, and consumption for different age-sex-skill groups since 2000. While all groups experienced a persistent decline in working hours, we use a variety of data sources and outcome variables to document that the declines in hours was largest for LEYM. For example, these trends are robust to including schooling as a form of employment. We document that 22 percent of LEYM report not working at all during the prior year in 2015. The comparable number in 2000 was only 9 percent. Not only have hours fallen for LEYM, but there is a large and growing segment of this population that has remained detached from the labor market.

A natural question is how LEYM support themselves. We document that 70 percent of non-employed LEYM lived with a parent or close relative in 2015, while only 9 percent are married. The corresponding fractions in 2000 were 49 percent and 15. The importance of cohabitation with a parent has been emphasized in the business-cycle context by Kaplan (2012) and Dyrda, Kaplan and Rios-Rull (2012). We document that it is also relevant for the longer-run decline in employment of young men. While government transfers are not

[1] We discuss in detail our wage, employment and consumption measures below.

large for LEYM, family transfers are substantial. To get a sense of the value of such intra-family transfers, we measure the consumption of young men using the Consumer Expenditure Survey (CE). Specifically, we compute the average expenditure by households that contain LEYM compared to the average household, scaled appropriately for household size. This exercise indicates that the consumption of LEYM has not fallen relative to the reference group of all prime-age men. Moreover, non-employed LEYM did not experience large consumption declines relative to their employed counterparts. While living with parents in one's twenties may have a utility cost, in terms of measured household expenditure on nondurables, LEYM appear largely insured against non-employment.

A convenient way to combine these trends in hours, wages, and consumption is to construct a labor-supply "wedge," that is, the gap between the real wage and the marginal rate of substitution between consumption and leisure. Using iso-elastic, separable preferences with standard elasticities, we document an increase in the labor-supply wedge for all prime-age men since 2000, but an even larger increase in the wedge for LEYM.

Note that the wedge calculation does not take a stand on the shift in labor demand. There is substantial evidence that labor demand has declined for less skilled men, which we summarize in the related literature section below. Our wedge calculation shows that the combination of declining hours and real wages plus relatively stable consumption is inconsistent with movements along a labor supply curve with standard elasticities. A plausible interpretation of the increase in the wedge is that there has been a shift in the level and/or the elasticity of labor supply for LEYM relative to all prime-age men. While rationing may be part of the story, the relatively long (15-year) time span plausibly suggests that labor supply is also a factor. Moreover, we use time diaries to document that home production activities declined in step with the decline in market hours since the early 2000's. Comparing time use for 2004-07 to seven years later, 2011-2014, we show that while market hours worked by PAM fell by 5%, their time in home production fell by 7% (from 14.0 hours per week to 13.1). For LEYM the drop in home production is even more extreme. While hours worked in the market fell by 10%, time in home production actually fell by 15% (from 12.4 hours to 10.6).

In the second part of the paper we develop a methodology that exploits how households allocate their time away from work to infer shifts in labor supply for different groups. To guide our approach, we introduce the concept of "leisure Engel curves" that describe how individuals allocate an increase in leisure across alternative activities. These can be estimated as a leisure demand system in a manner that parallels the large literature estimating consumption demand systems. Leisure luxuries can be defined in the same way as in the consumption context; namely, those leisure sub-activities that increase disproportionately with the total time devoted to leisure. We show that much can be learned about the labor-leisure tradeoff simply by looking at how leisure time is allocated across different leisure activities with varying sensitivity to overall leisure time.

Our framework builds on the seminal papers of Mincer (1963) and Becker (1965), which emphasize the importance of how time is allocated away from the market as an input into labor supply. These papers have been particularly influential in regard to female labor force participation. Specifically, the fact that women's non-market time has traditionally been devoted to home production implies that women's labor supply is particularly sensitive to increases in their wage relative to the price of market substitutes for non-market production.[2] Men, on the other hand, spend a larger fraction of their non-market time in what can be considered leisure activities, a pattern we document using the American Time Use Survey (ATUS).

The fact that leisure does not have close market substitutes, and the Mincer-Becker logic discussed above, might suggest that men's labor supply shows little sensitivity to movements in their wage relative to market-produced leisure inputs. However, we show that this is not the case. The logic builds on the idea that luxuries exhibit little diminishing returns.[3] In our framework, the Frisch elasticity of leisure depends on the share of time devoted to

[2]See Greenwood, Seshadri, and Yorokoglu (2005) for a quantitative exploration of this mechanism.

[3]In the context of consumption, see for instance Browning and Crossley, 2000.

leisure "luxuries," much in the same way the inter-temporal elasticity of substitution over consumption is determined by the underlying demand system for individual category of goods (Crossley and Low 2011). This naturally implies that those with more leisure time, because their activities skew toward leisure luxuries, exhibit more elastic labor supply.

A second implication is that technological progress in leisure luxuries, by increasing the share of time devoted to those activities, will drive up total leisure while also making labor supply more elastic. We show that a decline in the price of a market input into a leisure luxury has the same effect. In the case of female employment and home production, the natural assumption is that time and market inputs are substitutes into the production of a necessity, such as food. For young men, the reverse is true; time and market inputs are complements in the production of a luxury commodity. The net result is that innovations in leisure technology cause individuals to reallocate time towards leisure and make labor supply more responsive to market wages.[4]

In the third part of the paper, we take our model to the data. We start by describing the allocation of time away from market work during the 2000s for LEYM as well as several reference groups. We document that LEYM experienced a disproportionate increase in time devoted to computer usage and video games. Specifically, non-employed LEYM on average spend over 12 hours a week in leisure computer time, over three-quarters of that spent playing video games. The time they spend on video games is more than that spent on home production, socializing with friends, exercising/playing sports, or doing other hobbies. LEYM comprise 40 percent of total video gaming by all men and women aged 21 to 55, despite being only 10 percent of that population. LEYM show a dramatic shift in leisure choices over the past 10 years, with video and computer games comprising a much larger share of their activities. These shifts, while there, are less pronounced for other groups. We

[4] This point complements the work of Greenwood and Vandenbroucke 2008, Vandenbroucke 2009, and Kopecky 2011, who use a quantitative Beckerian model to show that a relative decline in the price of leisure goods is important in explaining secular trends in employment over the last century. We augment this approach by considering a leisure "demand system" and exploring how the allocation of leisure time across different types of activities may also be relevant for both the level and elasticity of labor supply.

show that this shift in leisure time accompanied a dramatic decline in the relative price of video games and other computer peripherals.

Given our guiding framework, an important question is whether computer games are in fact leisure luxuries. To answer this, we estimate leisure demand systems for different demographic groups to see how their individual leisure activities respond to an overall increase in leisure time. For identification we exploit cross-state variation under the premise that innovations in leisure technology are similar across states, while other shocks to labor markets vary by region, driving variation in total leisure. We estimate that computer and video games are leisure luxuries for young men, with a 1% increase in total leisure increasing their computer and video game playing by 2% to 3%. Most other leisure categories have elasticities less than or equal to one, indicating they are relative leisure necessities.

We then use our theoretical framework to back out the shift in the relative utility weight placed on video games and computers in leisure. Specifically, we infer the shift based on how leisure has been reallocated across activities given the parameter estimates from our leisure demand system. This weight is a measure of the improvement in the return to time spent on video game and computer leisure. Of course, increased video gaming and computer time for LEYM in recent years reflects, not only technology change, but that these activities are leisure luxuries and LEYM's total leisure has increased. Our estimated leisure Engel curves allow us to disentangle these two effects.

We calculate the impact of computer and video game technology on total leisure under two scenarios. The first assumes consumption is held constant, which in our framework is the same as holding the marginal value of a dollar constant. This specification is consistent with our descriptive facts on how consumption has evolved for LEYM since 2000. The second assumes individuals are hand-to-mouth, so consumption equals labor earnings. The latter introduces an income effect that mitigates the incentive to respond to improvements in leisure activities. Both scenarios hold wages constant; that is, they calculate the shift in the labor supply curve for a given wage, but do not incorporate that the decline in labor supply may drive up wages in equilibrium. The consumption-constant exercise suggests that improvements in the return to computers and video games shifted labor supply by an amount roughly 45 percent of the observed decline in market work for LEYM. Including the income effect lowers this number to roughly 20 percent. We also document that the increase in computer and video game technology explains between one-third and three-quarters of the difference in the trend of market work hours for LEYM relative to all prime age men since the early 2000s.

We conclude with one final analysis. Our narrative emphasizes labor supply and the role of leisure luxuries. This suggests that young men are optimally allocating their time to leisure luxuries, given wages, prices, and intra-family transfers. An alternative is that the non-employed men are rationed in their market hours, perhaps due to longer-run rigidities that disproportionately affect less-educated young men. One popular avenue to explore whether LEYM are unhappy with their non-employment is to use survey data on happiness. In this spirit, we use detailed data on life satisfaction from the General Social Survey (GSS) to document that LEYM as a group increased their self-reported happiness during the 2000s. This occurred despite stagnant wages, declining employment rates and increased propensity to live with parents/relatives. These patterns stand in stark contrast to the life satisfaction results of older non-college workers during the 2000s. For these older workers, life satisfaction fell sharply, tracking their declines in employment. While not conclusive, the results are consistent with the increased value for LEYM from their leisure options.

There is a large literature discussing the decline in employment rates within the U.S. during the Great Recession.[5] A separate literature has focused on more structural forces to explain employment declines during the 2000s.[6] Collectively, these papers provide evidence – often by exploiting cross-region variation – that declining labor demand has been the

[5] See, for example, Hall (2011), Mian and Sufi (2014), Giroud and Mueller (2015), Chodorow-Reich (2014), and Baker, Bloom and Davis (2013).

[6] For example, Autor et al. (2003), Moffit (2012), Autor and Dorn (2013), Autor, Dorn and Hanson (2013), Hall (2014), Charles, Hurst, and Notowidigdo (2016a,b), and Acemoglu et al. (2016). For a discussion of longer term trends in male labor force participation, see Council of Economic Advisors report (2016).

predominant factor for depressed wages and employment rates during the 2000s, with the effects concentrated among prime-age less-educated workers. Our work complements this extensive literature by adding another force for the decline in hours worked during this period. We argue that changes in leisure technology had an effect on both the level and the elasticity of labor supply. These technological advances in leisure luxuries can help reconcile the joint movements of employment, wages, and consumption during the 2000s. Declining labor demand put downward pressure on the wages during the 2000s. Our results speak to why hours declined so dramatically with only a modest fall in real wages. Additionally, we document that younger men were more likely to adopt the new leisure technologies relative to older workers. If the decline in labor demand was similar across age groups, our results help explain why employment fell more for LEYM relative to their older counterparts during the 2000s.

The paper is organized as follows: Section 2 briefly discusses the datasets used; Section 3 documents trends in hours and wages; Section 4 discusses cohabitation, transfers, and consumption; Section 5 combines the preceding facts to calculate a "labor-supply wedge;" Section 6 introduces a theoretical framework to motivate our leisure Engel curves; Section 7 documents time use on leisure activities; Section 8 estimates leisure Engel curves; Section 9 performs a simple back-of-the-envelope calculation linking shifts in leisure activities to the overall increase in leisure; Section 10 discusses happiness data; and Section 11 concludes.

2 Data

In this paper, we use five primary datasets, as well as several additional datasets for robustness and extensions. In the interests of space, we simply give a brief overview of each one and relegate the details to the Data Appendix.

For trends in employment and wages, our primary dataset is the March Current Population Survey (CPS). We restrict the sample to include civilian individuals between the ages of 21 and 55 (inclusive). We define annual hours worked by multiplying self reported weeks worked during the prior year and self reported usual hours worked per week during the prior year. We also measure individual employment rates. We designate an individual as employed if they report currently having a job. When reporting results, we refer to "year" as the year the data corresponds to. This implies that year 2010 employment rates refer to employment in March 2010, while reports of annual hours worked in 2010 come from 2011 survey responses. We also use the CPS for rates of schooling. The March CPS asks those aged 24 and under if they are attending school full time. We augment this data with the October supplement of the CPS surveys enrollment information for all individuals, allowing us to construct schooling rates for the full sample.

For cohabitation, we use the 2000 Census and the American Community Surveys (ACS) between 2001 and 2014. We also use the Panel Study of Income Dynamics (PSID) to measure transfers, both from the government and from relatives. We examine the PSID for eight biannual surveys, spanning survey years 1999 to 2013. For consumption, our primary dataset is the Consumer Expenditure Survey (CE). We perform robustness using the expenditure data collected by the PSID.

For leisure activities, as well as to supplement the market hours reported in the CPS, we use the detailed time diaries of the American Time Use Survey (ATUS). The ATUS is an annual survey started in 2003 that asks survey respondents to report how they allocated their time during the prior 24 hour period. (So each respondent has one day's activities recorded.) The ATUS sample is drawn from the exiting rotation of the CPS. As with the CPS, we restrict our sample to individuals between the ages of 21 and 55 (inclusive). While time use is reported for one day, we convert to units of hours per week.

We use the General Social Survey (GSS) to examine trends in reported life satisfaction for young non-college men relative to other groups. The GSS is a nationally represented bi-annual survey that is designed to assess attitudes and beliefs of US residents. During the 2000s, each wave of the GSS has between 2,000 and 4,000 respondents.

3 Employment Trends

In this section, we document a series of facts about the labor market changes for young non-college men relative to other age, sex, and schooling groups during the 2000s. When showing labor market trends, we focus on three age groups: young (those aged 21-30), older (those aged 31-55) and all prime age (those aged 21-55). Also, we focus on two skill groups: non-college (those with less than a bachelor's degree) and college (those with a bachelor's degree or more). We first present data on employment and then discuss trends in hours.

3.1 Trends in Employment

Figure 1 documents trends in employment rates for all prime age men and LEYM, using data from the CPS. While hovering around 85 percent from 1977 through 2000, employment rates for all prime-age men fell by 10 percentage points between 2000 and 2010, and have only rebounded modestly through 2015. While it has been well documented that the employment rate for prime-age workers has fallen sharply during the 2000s, Figure 1 also highlights a more pronounced decline for LEYM.[7] Between 1977 and 2000, the employment rate of this group stayed near 80 percent. Between 2000 and 2007, their employment rate fell by 3 percentage points (from 82% to 79%). During the recession, the employment rate of this group plummeted by an additional 11 percentage points (to 68%). The decline in their employment has been persistent despite the economy recovering. As of 2015, the employment rate of non-college men between the ages of 21 and 30 was 10 percentage points lower than it was in 2000. Roughly 40 percent of the decline in the employment rate for all prime age men can be accounted for by the decline in the employment rate of LEYM.[8]

Figure 2 shows the fraction of LEYM in the March CPS that report working zero hours in the prior year. In 2000, about 9.5 percent of this group reported working zero hours during the prior calendar year. As of 2015, the number had reached all the way to 22 percent. From

[7] Add cites

[8] Throughout the 2000s, LEYM represent roughly 22 percent of all prime age men.

Figure 2 we see that the share with zero hours climbed steadily throughout the 2000s and has remained persistently high during the recovery. In particular, there has been no reversal at all during the 2010-2015 period in the fraction of LEYM that has not worked during the prior year. Thus, not only has the employment rate fallen sharply during the 2000s for non-college men, but now nearly one-quarter of this group report not working at all during the prior 12 months.

Table 1 and Figure 3 documents annual hours worked for different sex-age-skill groups in the 2000s. We highlight data for 2000, 2007, 2010, and 2015. Table 1 is organized such that Panel A focuses on workers with less than a bachelor's degree (non-college) and Panel B focuses on workers with a bachelor's degree or more (college). We focus on two age groups: those aged 21-30 (young) and those aged 31-55 (older). Young non-college men experienced a 300 hour per year decline in hours worked between 2000 and 2015. While all groups experienced declines in employment during the 2000s, the decline in market work hours was 100 hours per year larger for LEYM than any other age-sex-skill group during this time period. The decline in hours for LEYM represented a fall of 20% (from 1700 hours per year to 1400 hours per year). Young college men and older non-college men both experienced declines in annual hours of about 10 percent. The results in Table 1 motivate our focus on young non-college men.[9]

Figure 3 shows the time series patterns in log hours worked for LEYM and all prime age men. The figure is constructed such that each observation is the log deviation in market hours worked relative to year 2000. As seen from Figure 3, there was a slight difference in the relative trend of hours worked between LEYM and prime age men during the 2000 to 2007 period. During the pre-recession portion of the early 2000s, LEYM experienced a seven percent decline in hours while all prime age men only experienced a four percent decline. After 2007, the decline in hours worked was much larger for LEYM than for all prime age

[9] We examined trends separately for those with less than a high school degree, those with exactly a high school degree and those with some college but not a bachelor's degree. Given that the trends were roughly similar within these groups, we decided to pool all the groups together.

men.

Table 1 also shows that young women with less than a bachelor's degree experienced a 200 hour per year (18 percent decline) in hours worked between 2000 and 2015. Table 2 highlights, however, that as young women reduced their market work hours, they increased their propensity to go to school full time. The upward trend in rate of college attendance for women relative to men started in the early 1980s.[10] The top panel of Table 2 uses data from the March CPS to measure trends in employment rates and "employment plus full time schooling" rates for individuals 21-24 during the 2000s. The first two columns focus on non-college men while the second two columns focus on non-college women. For each group, we show changes in the employment rate and the employment + schooling rate. The employment rate of non-college men ages 21-24 fell by 13 percentage points, while their employment+schooling rate fell by 8 percentage points. So part of the decline in market hours for the age 21-24 men is offset by an increase in full-time college attendance. For the women, however, there was near complete offset. Employment rates for young women, less than 16 years of schooling, experienced an 8 percentage point decline in employment between 2000 and 2015, but their employment plus schooling rates fell by only 1 percentage points.

Panel B of Table 2 uses data from the October CPS supplement that reports enrollment for all individuals. As seen from panel B, even accounting for full-time college enrollment, LEYM experienced the largest decline in employment rates during the 2000s across demographic/schooling groups.

We also break the sample of less-educated young men by race, comparing black respondents to US-born whites. Figure 4 is analogous to Figure 2 and shows separately the fraction of young non-college men who report working zero hours in the prior year by race. The fraction of young non-college black men that report working zero hours is 13 percentage points higher than comparable white men. However, the trends are nearly identical between the two groups. Appendix Table A2 contains more details about the decline in work hours for

[10]For a discussion of trends in college attendance for young men and women during the 2000s, see Charles, Hurst, and Notowidigdo (2016b).

different sub-samples. In particular, the percentage decline in hours during the 2000s was nearly identical for the white and black subsamples of LEYM: The decline equaled 19.3 percent (from 1,760 to 1,450 hours per year) for whites, while equaling 22.6 percent (from 1,380 to 1,100 hours per year) for blacks. The absolute decline in hours was larger for young white men. From this, we conclude that the decline in employment for young non-college men is broad based, in that it occurred similarly for whites and blacks.[11]

Tables 3 highlights the decline in total work plus schooling time for young non-college men from the vantage point of the American Time Use Surveys (ATUS). We split the day's activities into five broad time use categories: market work, home production, child care, education, and leisure.[12] All categories include any associated commuting time. Column 1 of Table 3 shows the change in average hours per week spent on each of our five broad categories for LEYM. To increase power, we group together data from the 2004-2007 period (four year period prior to the Great Recession) and from the 2011-2014 period (four year period after the Great Recession). LEYM, on average, reduced their time spent on market work and home production by 3.4 and 1.8 hours per week, respectively. The decline in home production for all groups is part of a sustained trend starting in the mid 1960s.[13] The decline in time spent on market work is just reflective of the trends documented in Table 1. As market work and home production declined, young non-college men increased their time spent on education by about 1 hour per week and their time spent on leisure by nearly 4 hours per week. As seen from the remaining columns of Table 3, the increase in leisure for LEYM was larger than for any other demographic/schooling group. We highlight four comparison groups for LEYM: young less educated women, young more educated men, and older less educated men. These other groups increased leisure from the mid 2000s through

[11]Appendix Table A2 also shows that the decline in hours for LEYM occurred similarly for those living in center cities within an MSA (18.6%), those living outside of center cities but still living within an MSA (21.3%), and those living outside MSAs (16.5%).

[12]We define our categories as described in Aguiar, Hurst and Karabarbounis (2013), though they include an added category "other" that captures time spent on civic and religious activities, own medical care, and other unclassified time use.

[13]See Aguiar and Hurst (2007).

2014 by, respectively, 2.4, 1.2, and 1.2 hours per week. Collectively, the results in Tables 1-3 show that while hours and employment rates declined for all groups during the 2000s, the declines were much larger for young men with less than a bachelor's degree. The tables also show that this relative decline in work hours for LEYM was not offset by increased time spent going to school or increased time in home production or child care.

3.2 Trends in Real Wages

We construct wages using March CPS data from individual labor income earned during the prior year divided by annual hours worked during the prior year. When making wage comparisons over time using repeated cross section data, it is important to adjust for the changing composition of the work force over time.[14] We do three things to mitigate the effects of selection when interpreting our time series trends in wages. First, we restrict our wage sample to include only individuals with a strong attachment to the labor force. In particular, we only include individuals who (1) report currently working, (2) report working 48 weeks during the prior year, (3) report working at least 30 hours per week during the prior year, and (4) report positive labor earnings during the prior year. After computing individual wages for this sample, we drop the top and bottom one percent of the wage distribution to minimize the role of outliers.

Second, we account for observable changes in composition by demographically adjusting our data for changes in educational attainment and age over time. We do so by computing the average wage in each of 28 demographic bins, where the bins reflect 7 five year age categories (21-25, 26-30, etc.) and 4 education categories (less than high school, exactly high school, some college, college degree or more). For each year, we construct an aggregate wage series by taking a weighted average of the cell mean wages using the demographic cell sizes observed in year 2000 as weights. We do not demographically adjust the LEYM sub-sample given it is already focused on a relatively narrow group. Finally, we perform

[14] See, for example, Barsky et al. (1992).

a robustness check to assess the potential for selection using the panel dimension of the CPS. Specifically, we link individuals across neighboring March supplements and compute an average growth rate. From these annual growth rates, we construct a time series for wages. This wage series is reported in Appendix Figure A1.[15]

Figure 5 plots log real wages for LEYM and all prime age men during the 2000s.[16] Each series is normalized to zero in 2000 such that all subsequent years are interpretted as log deviations in real wages from year 2000. Unlike the evolution of hours during the 2000s, the evolution of wages was nearly identical between LEYM and all men over the last 15 years. Real wages for both groups fell by about 5 percent during the 2000-2007 period. During the 2007-2014 period, when employment fell sharply, real wages experienced another 5 percent decline. Below, we are going to use a standard model of individual supply to jointly interpret changes in hours, wages, and consumption during the 2000s. The fact that there were only modest declines in real wages despite a very large decline in hours will result in an increasing labor supply wedge during this time period.

4 Co-Habitation and Consumption

How do these young men support themselves if they are not working? In this section, we discuss transfers, both from families and from the government. We then construct measures of consumption using micro-data from the Consumer Expenditure Survey and PSID.

[15]The appendix also describes how individuals are matched across CPS surveys. Rates of wage growth data from panel data, such as our matched CPS, embed an age/experience effect. Therefore, caution is needed when interpreting wage changes for continuing workers since these changes combine age and time effects. In the appendix we show that results are broadly consistent when restricted to men ages 45-55, for whom age effects should be much smaller.

[16]We deflate all nominal variables in the paper using a price deflator for non-durable goods and services. See the data appendix for details about the construction of the price deflator.

4.1 Cohabitation

Family transfers are an important element for understanding how LEYM live. Table 4 uses data from the 2000 Census and the 2001-2014 American Community Surveys (ACS) to document cohabitation patterns of less-educated young men during the 2000s. The Census and ACS include variables about household headship. A household head is the person or persons that own or rents the housing unit. Each respondent within the household is asked their relationship to the household head. In Table 4, the first column shows the trend in the fraction of LEYM that report living in a household where their parent or step-parent is the household head. The second column includes the fraction who report that a non-spouse relative is the household head. In this column, we include living with a parent (as in column 1) as well as living with a brother, sister, grandparent, aunt, uncle, etc. In 2000, 35 percent of all non-college young men lived with a relative. By 2014, that number was over 50 percent. Most of the trend is attributed to a greater increase in living with one's parent. The cohabitation patterns of LEYM differ from that of other sex-skill groups. For example, only about 40 percent of young non-college women and about 30 percent of young college men and women lived with a parent or relative in 2014. It should be noted, however, that all groups did experience an increase in cohabitation with parents and relatives during the 2000s.[17]

Table 5 shows the detailed cohabitation patterns for LEYM by employment status pooling together data from the 2011-2014 ACS. Column 1 shows the patterns for those who report currently working and who report not attending school full time. Columns 2 shows the patterns for those who are not working and not in school full time. For those young college men that are not working, 70 percent live with a parent or another close relative. Only 10 percent live in a residence in which they report being a non-married head and another 7 percent live in a residence in which they are a head with their spouse. The remaining group live with a partner or friend (9 percent) and with other individuals who are not a relative or

[17]We show results analogous to those in Table 4 for other sex-skill groups in Appendix Table A1.

close friend/partner (4 percent). Even though non-working LEYM may not directly receive many transfers from the government, they do receive transfers from family and relatives.

4.2 Government Transfers

According to data from the 2011-2014 American Community Surveys, only 9 percent of non working LEYM are married and only 12 percent have a child. The fact that they are not married or do not have children suggests that government programs are not an explanation for their reduced labor market attachment. Young single childless men do not receive welfare programs like SNAP. Their lack of work experience means most are not receiving unemployment benefits. Disability take-up is rare for this age group.

In Appendix Table A3, we explore in more detail trends in government and private transfers to young men's households based on the Panel Study of Income Dynamics (PSID). An advantage of the PSID is that it is possible to see transfers in the form of help from relatives, beyond the important component of cohabiting with a parent or relative. While pointing to the appendix, we highlight here a few primary takeaways.

First, for LEYM that do not live with relatives, help from relatives is still fairly common, with about 20 percent of households reporting such help. But these transfers are small on average. For instance, from the 2005 survey, in which such transfers were most common, 27 percent of LEYM not living with relatives reported receiving such help. The average transfer (including zeros), however, was only 1.5 percent of average earnings for the households.

Second, as anticipated by the discussion above, government transfers are reasonably small on average for households headed by the non-college young men. Government transfers (like SNAP, unemployment benefits, ect.) average just under 2.9 percent of average household earnings for these households, while tax credits (EITC, child credits, etc.) average another 2.3 percent. The most notable time variation in these government transfers is a spike in unemployment insurance benefits during the Great Recession at 2.4 percent of average earnings, compared to less than 1 percent for all years before and after the Great Recession.

Government transfers are much more important for households where LEYM live with parents or other relatives. Across the eight surveys, government transfers plus credits averaged \$6,657 per household in 2009 dollars; this represented 14.1 percent of average earnings for these households. The transfers have increased substantially with time. By the last available survey in 2013 (calendar year 2012) tranfers/credits reached \$9,160 (2009 dollars), equal to 24.0 percent of average earnings for these households. The government payments presumably contribute toward spending by the young men in these households, even if they are not the direct beneficiary. In fact the most important government payment, both in terms of level and trend growth for these households are social security income benefits, which averaged \$4,286 (2009 dollars) in the 2013 survey. For these payments the young men are unlikely to be the direct recipient.

4.3 Consumption

To construct consumption for prime-age men and LEYM, we begin with the Consumer Expenditure Survey. The first difficulty lies in the fact that the CE measures consumption at the household level, while our analysis on hours and wages concerns individuals. A common approach is to deflate total household expenditure by a measure of household scale. Specifically, suppose household j has N_j members and X_j dollars of expenditure (we suppress the time index in what follows). Then the per-individual "consumption equivalent" x_j is:

$$x_j = \frac{X_j}{(1 + 0.7(N_j - 1))^{0.7}}.$$

This implies additional household members after the first are weighted by 0.7, and the overall returns to scale of the household is also given by 0.7.[18] Note that we treat all household members symmetrically. Thus, in a household with a working prime-age adult plus a non-employed young man, we would allocate an equal amount of consumption to both. This

[18] This factor has an elasticity with respect to family size that is in midrange of values typically employed (e.g., Jensen, 1988).

assumes that young individuals living with their parents get a representative portion of the household's spending. To the extent that the expenditure of such households are geared towards the parents, we will overestimate consumption of these young men.

The second complication is that the CE under-reports consumption relative to the national income accounts, even adjusting for different coverage, and the under-reporting has been increasing over time (see Garner, et al., 2009). Therefore, we use the CE expenditure to obtain a measure of *relative* consumption, but not of the level. Specifically, let g index a group of individuals, such as LEYM or prime-age men (PAM), and J_g the set of households that contain an individual in the set g. For each group $g \in \{LEYM, PAM\}$, we average x_j over $j \in J_g$, and divide by the average x_j over all households in the CE (using CE-provided sampling weights). This ratio reflects how individuals in a particular group compare to the average of all individuals in terms of consumption equivalents. We denote this ratio s_g.

The final step is to obtain per capita expenditure on non-durables and services from the BEA's national income accounts. If C denotes the BEA measure, then the average consumption of individuals in group g is given by $C_g = s_g C$. While circuitous, this calculation is designed to address both the under-reporting of expenditure in the CE and the need to extract individual consumption from household expenditure. Our assumption on the latter is a standard approach to this well-known issue. On the former, our assumption is that the measurement error in the CE displays a common trend across our subgroups of interest, specifically households that contain young non-college men versus those that contain prime-age men.[19] Notice that armed with separate estimates s_{LEYM} for young non-college men and s_{PAM} for all prime-aged men, an estimate of consumption of the young, non-college men relative to all prime-aged men is given simply by s_{LEYM}/s_{PAM}, which does not involve aggregate expenditure.

In Figure 6, we plot log real consumption relative to the level in 2000 for LEYM and

[19] Because even this assumption appears questionable (see Aguiar and Bils, 2015), as a robustness exercise we additionally exploit the PSID's broader focus on expenditures since its 1999 survey to perform a check on our findings from the CE.

all prime-age men. While consumption increased during the 1990-2005 period, consumption was relatively flat for both all men and LEYM in the second half of the 2000s. The striking fact of Figure 6 is that the consumption of LEYM has tracked that of all prime-age men closely, particularly during the Great Recession. This reflects that LEYM are typically part of a larger household that includes older adults. Although not reported in the figure, we can separately compute the consumption of LEYM broken down by employment status. Since 1990, non-employed LEYM have fared better than their employed counterparts. Again, this reflects that non-employed LEYM are more likely to cohabit with other adults. This exercise does not incorporate any additional utility cost of cohabitation, a feature of the model of Kaplan (2012). Nevertheless, in terms of reported expenditures scaled by household size, LEYM appear well insured against non-employment.[20]

5 Declining Hours and the Labor Supply Wedge

To organize the relationships between hours worked, wages, and consumption during the 2000s, for all men and young non-college men, we estimate the evolution of the "labor supply wedge." Consider an individual with preferences over consumption c and leisure time H given by $u(c, H)$. In a given period, the individual faces a linear real wage w/p and has one unit of time to allocate between leisure and market work $n = 1 - H$. Assuming an interior optimum, the static optimality condition equates the marginal rate of substitution between leisure and consumption, u_H/u_c to the real wage w/p. We define the labor supply

[20]We conducted two robustness exercises for measuring the relative consumption of LEYM. One is to measure relative expenditure trends based only on individuals not cohabiting with relatives. This implies about 3 percent slower growth in consumption for the LEYM relative to all prime-age men since 2000. Secondly, we base relative consumption growth on data from the PSID. The PSID estimates suggest about 5 percent slower growth in consumption for LEYM relative to all prime-age men between 2000 and 2012 (the most recent data available for the PSID). When taking our model of leisure luxuries to the data, we will experiment with different assumptions pertaining to the consumption patterns of the LEYM relative to other groups.

wedge by:[21]

$$\tau \equiv \frac{w}{p}\frac{u_c}{u_H}.$$

Much of the literature estimating this wedge has focused on its cyclical behavior. As a result, its movements are typically interpreted as reflecting frictions in the labor market, including wage rigidities. We are focused on relatively long-term trends in this wedge, where frictions and wage rigidity are less obvious candidates for these patterns. The labor supply wedge will reflect not only labor-market distortions, but any mispecification of labor supply, i.e., any factors that shift labor supply, but are not accounted for by the econometrician. After presenting the empirical patterns for the labor supply wedge, we turn to this possibility in detail.[22]

To construct an empirical estimate, we assume the intertemporal elasticity of substitution for both consumption and labor are constant and set to one. We also assume preferences are stable over time. Keep in mind that we use these preferences to establish a benchmark that is familiar from the wedge literature. The extent to which they are mis-specified will be reflected in the wedge, which will be a motivation for the second half of the paper.

We then have

$$\ln \tau \propto \ln \frac{w}{p} - \ln c - \ln n.$$

We normalize our measure of $\ln \tau$ to zero in the year 1990. We start in 1990 to observe the dynamics of the labor supply wedge prior to the 2000s. Any trends in τ hence reflect shifts in preferences, as well as such additional sources of mis-specification as trends in government

[21] The labor supply wedge is distinct from the overall "labor wedge" which refers to the gap between workers marginal rate of substitution and labor's marginal physical product (e.g., Hall 1997, Chari-Kehoe-McGrattan 20xx, Shimer 2009). The labor wedge equals the labor supply wedge plus any wedge between labor's marginal physical product and the real wage. The component we call the labor supply wedge has also been referred to as the wage mark-up (Gali, Gertler, and Lopez-Salido 2007).

[22] Another important candidate for movements in the estimated labor supply wedge is wage smoothing. Implicit contracting suggests firms will sustain workers at a real wage above their marginal rate of substitution in downturns. This will drive up the estimated labor supply wedge, even if no friction or shifts to labor supply has occurred–it simply reflects mispecification by the econometrician. While wage smoothing may play some role in the wedge trends we report, we expect it is more problematic for measuring cyclical movements in the labor supply wedge.

policies that drive a wedge between our measure $\frac{w}{p}$ and the marginal after-tax return to working and trends in labor market frictions that affect a worker's payout relative to $\frac{w}{p}$, or that possibly affect individuals' abilities to optimally choose hours worked. Another source of mis-specification is the use of average wages, consumption, and hours, which assumes the preferences are those of a representative agent.

Given these functional form assumptions, Figure 7 uses the data from Figures 3, 5 and 6 through to construct a labor supply wedge for all prime age men (panel A) and for LEYM relative to prime age men (panel B). Panel A depicts the log labor supply wedge for all prime-age men, normalized to zero in 1990. The wedge for all prime-age men trended down from 1990 through the mid 2000s. Recall that for this early period, consumption is increasing, wages decline slightly, yet hours are fairly stable. Viewed through the wedge calculation with our chosen utility, this indicates a shift out of labor supply. The extent of this shift is naturally sensitive to the choices of inter-temporal elasticities of substitution. However, relative to this trend, the Great Recession generates a large increase in the labor wedge. In particular, given flat consumption and wages, there is an unexplained decline in hours, although this uptick begins to reverse in recent years. In Panel B we depict the relative wedge, which is simply the difference between the wedge for prime age men and the wedge for LEYM. We see the relative wedge is increasing over the sample period, with a fairly significant increase in the 2000s and 2010s. The relative wedge summarizes the facts documented above; namely, a large relative decline in market hours for LEYM without a large decline in relative wages or consumption.[23]

The decline in hours for LEYM could conceivably have been explained by a large decline in their relative wages or a large increase in their relative consumption. But our wedge calculations suggest this was not the case–the relative decrease in annual hours for these

[23]The consumption of LEYM that were not cohabitating with relatives declines relative to prime-age men by roughly 3 percent, suggesting Figure 7 understates the increase in their relative wedge by the same amount, given our log preferences. Similarly, the PSID estimates suggest about 5 percent slower growth in consumption for LEYM relative to all prime-age men since 2000 compared to the CE data. These suggest the increase in the wedge depicted in Figure 7 during the 2000s may be a conservative estimate.

young men is essentially mirrored by an increase in their relative labor-supply wedge. The candidates most prominently cited in the business cycle literature for labor supply wedges, frictions and wage rigidities, may not be the most promising candidates for these trends of 15, or more, years. We turn next to modeling, as an alternative, the possibility of shifts in labor supply driven by changes in leisure technologies. More exactly, our focus is on introduction or improvements in leisure luxuries–that is, leisure activities that display little or no diminishing returns to time invested by participants. To explain the patterns above, this leisure technology is obviously most promising if it especially appeals to young men.

6 Leisure Luxuries and Labor Supply

6.1 The Benchmark Framework

This section provides a framework that is useful to organize our analysis of the empirical patterns. The key feature is a variety of leisure activities, some of which are "leisure luxuries." We link such activities to labor supply elasticities and show how changes in technology (or prices) of particular leisure activities affect the level and responsiveness of labor supply to wage changes

Consider a static problem in which an agent decides how to allocate time between market work and several leisure activities. The agent enjoys utility over a consumption good c, which is the numeraire, and time spent on leisure activities, h_i, $i = 1, ..., I$. For expositional simplicity, we assume utility is additively separable and each leisure activity enters total utility in an iso-elastic form:

$$U(c, h_1, ..., h_I) = u(c) + \sum_{i=1}^{I} \theta_i \frac{h_i^{1-\frac{1}{\eta_i}}}{1-\frac{1}{\eta_i}}.$$

Note that each leisure activity potentially has a different elasticity, η_i. This elasticity governs which activities are leisure luxuries versus necessities. Moreover, in our base specification, leisure utility is generated solely through time spent on the activity, without the presence of complementary goods. We make this assumption to build intuition. However, as we show in the subsequent section, the money inputs into computer and video game leisure activities are quite small. The preference shifter θ_i can be considered an exogenous quality of the leisure activity that captures the state of technology. A more realistic approach would be to embed the leisure technology in leisure goods, an extension we discuss below.

The agent faces a wage w in terms of the consumption good and has non-labor income, including transfer income, of y. The agent's problem is:

$$\begin{aligned} &\max_{c,\{h_i\}_{i=1}^{I}} U(c, h_1, ..., h_I) \qquad (1)\\ &\text{subject to}\\ &c \leq wn + y\\ &\sum_i h_i + n \leq 1\\ &n \geq 0. \end{aligned}$$

The individual's time endowment is normalized to 1. We omit the constraints that $h_i \geq 0$ as the functional forms ensure these never bind.

Given the additive separability, we can consider the sub-problem of allocating leisure time across activities given total leisure H:

$$\begin{aligned} v(H) \equiv &\max_{\{h_i\}_{i=1}^{I}} \sum_i \theta_i \frac{h_i^{1-\frac{1}{\eta_i}}}{1-\frac{1}{\eta_i}}\\ &\text{subject to}\\ &\sum_i h_i \leq H. \end{aligned}$$

Let μ denote the multiplier on the total leisure constraint, and the first-order conditions are:

$$\theta_i h_i^{-\frac{1}{\eta_i}} = \mu. \tag{2}$$

The time constraint will hold with equality, and substituting in (2) we have:

$$H = \sum_i \theta^{\eta_i} \mu^{-\eta_i}. \tag{3}$$

Given H, there is a unique positive solution μ to (3). The envelope condition implies that $v'(H) = \mu$.

Returning to the original problem (1), we have:

$$\begin{aligned} &\max_{c,H} u(c) + v(H) \\ &\text{subject to} \\ &c \leq w(1-H) + y \\ &H \in [0,1]. \end{aligned}$$

Assuming an interior solution, we have the familiar optimality condition:

$$v'(H) = wu'(c). \tag{4}$$

Define ϵ as the elasticity of total leisure with respect to w, holding the marginal utility of consumption constant (the Frisch elasticity of leisure). Specifically:

$$\epsilon \equiv -\left.\frac{d\ln H}{d\ln w}\right|_c = -\frac{v'(H)}{Hv''(H)}. \tag{5}$$

Differentiating and manipulating equations (2) and (3), we derive the following:

$$\epsilon = \sum_i s_i \eta_i, \tag{6}$$

where $s_i = \frac{h_i}{H}$ is the share of total leisure devoted to activity i. Thus the Frisch elasticity of leisure is a weighted average of the individual activity elasticities, with the weights given by the share of time devoted to each activity. In this environment, one should keep in mind that the Frisch elasticity is not a structural parameter, but will in general vary with the level of H.[24]

A similar set of steps yields the following for how additional leisure time is allocated across activities. Specifically:

$$\frac{d \ln h_i}{d \ln H} = \frac{\eta_i}{\epsilon}.$$

Thus activities with a greater η_i increase disproportionately with total leisure time. That is, high η_i activities are "leisure luxuries". Our notion of a leisure luxury good is very similar to the notion of a consumption luxury good in traditional models of consumption demand systems. The distinction is that our metric is a function of time inputs as opposed to money inputs.

The preceding implies that as H increases, the shares spent on high-η luxuries increase, which from (6) raises the Frisch elasticity of leisure. For example, an increase in non-labor income y results in an increase in leisure time, H, through an income effect. Moreover, it also makes the agent more elastic to changes in wages.

For our purposes, a more interesting example is how a shift in technology θ_i translates

[24] There are close antecedents to this result in the consumption literature where there are multiple consumption goods. In particular, Crossley and Low (2011) discuss the restrictions necessary for a constant elasticity of inter-termporal substitution in a demand system involving multiple consumption goods. Browning and Crossley (2000) demonstrate the link between relative income elasticities and willingness to substitute inter-temporally. Both points have clear parallels to our current discussion of multiple leisure goods and labor supply elasticities.

into a shift in the elasticity of labor supply. In particular, let activity I denote the leisure activity with the highest elasticity parameter: $\eta_I > \eta_i$ for all $i < I$. Now suppose that θ_I increases, a proxy for an improvement in leisure technology.[25] First, recalling that $v'(H) = \mu$ and differentiating (3), we have:

$$\left.\frac{d \ln v'(H)}{d \ln \theta_I}\right|_H = \frac{s_I \eta_I}{\epsilon} = \frac{s_I \eta_I}{\sum_i s_i \eta_i}.$$

This is the change in the marginal value of leisure holding constant total leisure time H. An increase in θ_I raises the marginal utility, and the extent to which marginal utility rises is governed by how important that activity is in terms of its contribution to the overall elasticity.

Now consider the effect of a shift in θ_I on leisure time. To explore this, we need to take a stand on what happens to consumption. We explore two extremes. We first assume c remains constant, with any loss in labor earnings offset by an increase in non-labor income– that is, the individual is perfectly insured. Secondly, we assume $y = 0$; so the agent consumes $w(1 - H)$. In both cases, we hold w constant.

In the former case, with consumption insulated, we differentiate (4) to obtain:

$$\left.\frac{d \ln H}{d \ln \theta_I}\right|_{c,w} = -\frac{d \ln v'(H)/d \ln \theta_I}{d \ln v'(H)/d \ln H} = s_I \eta_I. \tag{7}$$

Thus the impact of a shift in technology is pinned down by the share of time allocated to the relevant activity times its elasticity.

If the agent is not compensated for foregone earnings, the impact on leisure will be

[25] One note on functional forms is that we introduce θ as a multiplicative shifter outside the iso-elastic term. This unambiguously raises the marginal return to that activity, but whether it increases utility depends on whether $\eta_I \gtreqless 1$. Alternatively, we could introduce θ as a technology shifter inside the iso-elastic function; that is, raise θ_I to the power $1 - 1/\eta_I$. One thing to keep in mind is that a more productive technology introduced in this way has an ambiguous effect on the demand for inputs. If $\eta_I \geq 1$, the two approaches have the same implications. However, if $\eta_I < 1$, the strong diminishing returns implies an improvement in leisure technology lowers demand for inputs. As we are treating activity I as a luxury, the unambiguous case of $\eta_I \geq 1$ is appropriate.

mitigated by the income effect. In particular, if $c = w(1-H)$ and $\gamma = -u''(c)c/u'(c)$, we have:

$$\left.\frac{d\ln H}{d\ln\theta_I}\right|_{c=w(1-H)} = \frac{s_I\eta_I}{1+\gamma\epsilon\left(\frac{H}{1-H}\right)}. \tag{8}$$

The fact that θ_I increases leads to a reallocation of leisure time towards activity I. As I is a leisure luxury, this implies an increase in ϵ holding constant H. Therefore, ϵ increases with θ_I due to the increase in H and the increase in s_I. In this manner, a technological improvement in a leisure luxury shifts market labor supply "in" and makes it more elastic.

6.2 Leisure Capital

In the preceding, the shift in θ_I was taken as an exogenous comparative static. There are two natural microfoundations for why the return to a particular activity could increase. One is a reduction in the price of complementary inputs purchased on the market, a point we discuss below. The other is the accumulation of "leisure capital," where previous experience with a leisure technology raises the return to additional time spent. The concept of leisure capital captures a number of issues that are useful for understanding time allocation of younger men. In particular, the technology of leisure production has changed over time. One can think of the general progression from radio to television to computer games. The latter has a much higher learning-by-doing component than the former two, which some might call the addictive nature of the activity (and θ the associated habit).

Specifically, let k_i denote the accumulated leisure capital in activity i, and $\theta_i = \Theta_i(k_i)$. The fact that the function Θ_i is indexed by i reflects that the manner in which previous experience translates into returns today depends on the nature of the activity. At one extreme, a very traditional technology may have a limited role for accumulated experience; watching a sun set does not require experience. On the other hand, modern technologies may have more interesting properties. For example, one can make a case that recent leisure technologies have an "S"-shaped Θ function. In the case of computer games, the novice player first experiences frustration. Over time, with the accumulation of skills, there is a rapid increase in the payoff to the activity. Eventually, as one masters the technology, diminishing returns set in and one's enjoyment plateaus. A similar trajectory applies for other modern leisure technologies, like social media platforms, in which one builds a network over time.

One important implication of this line of reasoning is that modern leisure technology makes previous work experience relevant for future labor supply, holding fixed wages, assets, and consumption expenditures c. Moreover, the impact of technological improvements may be particularly relevant for those with significant leisure experience, generating persistent effects from employment disruptions.

Viewed in this way, the comparative static involving a shift in θ_I would then involve the comparison of two agents with different levels of leisure capital (experience) in activity I. Fully exploring this phenomenon would involve extending the model to a dynamic setting. In the interests of brevity, we omit a formal extension, but instead informally flag a few interesting features of such an extension. One is that in the dynamic context, the wage is no longer the sole price of time. In a traditional model of learning-by-doing human capital accumulation, an extra hour spent on leisure lowers future wages, which raises the effective cost of leisure. On the other hand, if leisure capital is relevant, an extra hour raises the return to future leisure, lowering the effective cost today. In our empirical work, a focus is on less educated young men. At low education levels, experience profiles are flatter, suggesting a smaller role for on-the-job human capital accumulation. Moreover, for younger men, we see that leisure time is shifting towards computers/video-games, potentially suggesting an increase in the importance of leisure capital.

Finally, in the fully dynamic setting, there is scope for choosing which leisure activities to invest in at a point in time. This suggests a parallel to the tradeoffs familiar from the vintage technology literature. For young, less-skilled men, the modern technology with a steep learning curve may be the appropriate choice, as it represents a high-return investment. For older workers (at the time of the technology's arrival), this may not be worthwhile, given the steep learning curve and potential investments in alternative leisure technologies. Similarly, for young, high-skilled workers, the high opportunity cost of time may also make it sub-optimal. This offers a lifestyle choice between investing in a high-leisure/low-consumption technology that will suppress market hours going forward, or pursue a high-wage/low-leisure lifestyle that emphasizes consuming market goods. Such a decision may be relevant for contrasting the behavior of cohorts who enter into the workforce during deep recessions versus booms.

6.3 Complementary Leisure Inputs

The model presented above has only the consumption good as a market-purchased input into utility. We now briefly discuss the implications of introducing an additional market good that is an input into leisure. This will allow an exploration of how relative price changes affect labor supply. It will also allow a comparison with the literature on home production and labor supply, which dates back to Mincer (1962) and Becker (1965). These authors argued that women have a relatively elastic labor supply because their non-market time is spent in home production, which has close market substitutes. The fact that leisure does not have a close market substitute raises the question of whether our focus on leisure activities argues against a more elastic labor supply for young men. The resolution of this potential contradiction will be clear once we introduce some notation.

For simplicity, we now consider only one leisure activity, and hence drop the i subscript. However, leisure ℓ is now a composite of time h and a market input, x:

$$\ell = f(x, h) \equiv \left(x^{\frac{\sigma-1}{\sigma}} + h^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}},$$

where σ is the elasticity of substitution between time and goods in generating leisure. Preferences over consumption and the composite leisure commodity are given by:

$$U(c,\ell) = \frac{c^{1-\gamma}}{1-\gamma} + \theta\frac{\ell^{1-\frac{1}{\eta}}}{1-\frac{1}{\eta}}.$$

The agent's problem is the same as before, but the budget constraint is now $c + px \leq wn + y$, where p is the relative price of the leisure input x.

If n is interior, then the wage is the price of time. The total price of leisure is then:

$$q(p,w) = \left(p^{1-\sigma} + w^{1-\sigma}\right)^{\frac{1}{1-\sigma}}.$$

The agent's problem can then be written compactly:

$$\max_{c,\ell} U(c,\ell)$$

subject to

$$c + q\ell \leq y + w.$$

The inputs into leisure can be re-covered from Shephard's lemma as $x = \frac{\partial q}{\partial p}\ell$ and $h = \frac{\partial q}{\partial w}\ell$. The static optimality condition between consumption and leisure is:

$$U_\ell = qU_c.$$

We also have:

$$\begin{aligned} h &= \frac{\partial q}{\partial w}\ell \\ &= w^{-\sigma}q^{\sigma-\eta}\theta^{\eta}c^{\gamma\eta}. \end{aligned}$$

All else equal (including q), an increase in w lowers time spent on leisure (and hence raises work hours). This is governed by the elasticity of substitution between time and goods in the production of the leisure commodity, σ. This has a natural intuition that as time becomes more costly, it is optimal to substitute market inputs for time inputs in the production of a given amount of leisure. A given q and c implied a fixed scale of production of ℓ, and hence this is the only relevant elasticity.

The impact of an increase in q holding constant w (that is, an increase in p) has an ambiguous sign, determined by whether $\sigma \gtreqless \eta$. For a given level of ℓ, an increase in p induces substitution towards time in the production of leisure, raising h. The magnitude of this substitution is governed by the parameter σ. However, the increased cost of leisure induces a shift away from ℓ and toward consumption, which reduces all inputs into leisure, including time. The magnitude of this substitution is governed by the curvature parameter η. Which effect dominates depends on the strength of the two elasticities. A reasonable assumption for leisure luxuries (high-η leisure) is that time and market inputs are complements in production; so leisure exhibits little diminishing returns, hence $\sigma < 1 < \eta$. Thus an increase in p leads to a decrease in h. The fact that a reduction in the price of leisure inputs lowers labor supply has been explored quantitatively by Greenwood and Vandenbroucke 2008, Vandenbroucke 2009, and Kopecky 2011.

The "constant consumption" elasticity of leisure time with respect to the wage is now:

$$\epsilon = \sigma + (\eta - \sigma)\frac{wh}{q\ell},$$

where we hold p, as well as consumption, constant. The sign of the elasticity is unambiguous, but its magnitude depends on the importance of time (its "cost share") in producing leisure. As that cost share goes to one, the relevant margin of substitution is between leisure and consumption, which is governed by η. On the other hand, as the cost share goes to zero, the relevant margin is between time and goods in the production of leisure, which is governed by σ. A particularly relevant implication is that as p declines (which is the empirically relevant case), the cost share of time rises, assuming $\sigma < 1$. Moreover, if $\sigma < \eta$, as argued above, then the constant-consumption leisure elasticity is increasing over time. This suggests that reductions in the price of leisure-complementary goods (TV's, video games, etc.) will make agents more elastic with respect to wages for a given level of consumption.

This discussion highlights the link to the Mincer and Becker argument that home production makes labor supply more elastic. The natural assumption with home production such as cooking and cleaning is that time and goods are close substitutes ($\sigma > 1$) and diminishing returns are strong ($\eta < 1$). For this parameterization, as the price of the market input p falls, labor supply shifts out. Moreover, as $\sigma > 1$, the cost share of time in home production falls with p, increasing the weight on σ. The reverse is true if we consider non-market time as leisure, that is, if $\sigma < \eta$, which seems to be the relevant case for less-educated young men in recent decades. In this case, a decline in p shifts labor supply in and makes η relatively important in determining the leisure elasticity.

7 Time and Expenditure on Computer Use and Video Games

The prior section outlined how changes in the relative return of different leisure goods can affect an individual's labor supply curve. In this section, we outline a set of facts pertaining to how leisure time has evolved since year 2003. In the subsequent section, we estimate leisure Engel curves. These reveal the curvature in preferences (diminish returns) across different leisure activities.

The price of computers has fallen sharply during the last 15 years. Figure 8 shows the evolution of the composite CPI and the "computer and peripheral equipment" component of the CPI. We normalize both indices to be 100 in January of 2000. While the composite CPI experienced 40 percent inflation between 2000 and 2015, the price of computer goods has fallen to one-tenth its price level in 2000. Gaming expenditures are not part of the computer and peripheral equipment category. Instead, video and online games are a component of "toys and games." Combining published deflator series for "toys and games" with information on the importance of its subcategories (provided to us by the BLS), we calculate a deflator for "video games and accessories" from 2008 onward. Our estimates show that the price of video games and accessories fell by about 12 percent per year between 2008 and 2015. The price data show that there was an extremely large decline in the relative price of computer and video games since 2000. Furthermore, these changes likely understate the true relative price decline, assuming these categories had more unmeasured quality gains than typical for goods and services the CPI reflects. In terms of our model, the price data suggest large technological gains in the computer and gaming industries since 2000.

Our base model treats leisure consumption as solely a function of time inputs, as opposed to combining time and expenditure inputs. As a rough approximation, this assumption matches computer and video game consumption, as the expenditure component of computer and video game consumption is relatively small compared to time. Industry data reports that total spending on video and computer games was about $16.5 billion in 2015.[26] Industry data also states that about 150 million Americans report playing some form of video or computer game during 2015. This translates to an average of about $100 per year per person playing video or computer games. This should not be surprising given that subscriptions to online video game services average about $10 to $15 per month, the typical packaged video game costs around $50, and the average game app costs about $0.55.[27] Once purchasing the hardware - a computer, a smart phone or a video game console - the marginal cost in terms of playing video and computer games is to very small. However, as we show below, the time inputs are quite large.

[26] Data come from Entertainment Software Association which represents companies that publish computer and video games. Sales figures include revenues from physical video game sales, downloaded video games, mobile apps, social network gaming, and online gaming subscriptions.

[27] For example, the popular online game World of Warcraft charges roughly a $12/month fee, while popular console gaming companies like Xbox One and PlayStation charge monthly subscription fees of about $5/month. The Apple App Store reports the average price of a iOS gaming app as 55 cents. Pokeman Go, which was a worldwide sensation, was released for free.

7.1 The Changing Composition of Leisure Since the Early 2000's

We now use the ATUS to document how leisure is allocated across different sub-activities. Our total leisure category includes the following categories: total computer time; television and moving watching; socializing; exercising and playing sports; adjusted eating, sleeping and personal care; and other leisure. A few comments are needed on our classification. First, total computer time includes any time an individual spends on email, playing computer games, and using the computer for leisure (not games). Often, we will highlight the computer game subcomponent of total leisure time.[28] Other leisure includes activities such a reading, relaxing, listening to music, going to the theater, and engaging in hobbies.

Time spent eating, sleeping and on personal care has both a biological and leisure component. Individuals need a minimum amount of sleeping, eating and personal care to survive. However, each of these activities also has a leisure component. We assume that the biological component of eating, sleeping and personal care is 7 hours a day. Our adjusted eating, sleeping, and personal care measure is just total weekly hours spent on these categories minus 49. We choose 49 as this threshold because, among persons ages 21 to 55 in the ATUS, 95 percent report at least 7 hours per day for sleeping and personal care. (No demographic/schooling group considered ever average less than 7 hours per day on eating, sleeping, and personal care.) We stress that this threshold choice does not affect the results on the changing nature of time use documented in this section. Moreover, we show in the subsequent section that our estimates of leisure luxuries are quite invariant to subtracting off any biological adjustment for eating, sleeping and personal care between 6 and 9 hours per day.

Table 6 shows hours per week in various leisure categories for LEYM in 2004-2007 and

[28]The ATUS has a category of time use called "playing games."This category includes video games, but also includes playing cards as well as traditional board games like checkers, Scrabble, etc. The time use data do not allow us to distinguish playing the Scrabble board game from time spent on video games. As we document below, there was a very large increase in playing games during the 2000s,particularly for LEYM. We equate this increase with an increase in video game time. However, we realize that we may be identifying a Scrabble boom as opposed to a video game boom.

2011-2014. Consistent with results in Table 3, LEYM increased their leisure time by 3.6 hours per week from the mid 2000s through 2014. The increase was driven by increases in two categories. Sleeping, eating and personal care increased for these men by 1 hour per week and computer time increased by 2.7 hours per week. Of the 2.7 hours per week in computer time, three quarters was due to increased video game time (2.1 hours). Despite the overall increase in leisure time, time spent on other leisure categories like TV/movie watching, socialization and exercise/sports stayed roughly constant.

Table 7 shows the leisure patterns for LEYM by employment status. Several things are worth noting. First, the non-employed, not surprisingly, have more leisure time. As shown in Aguiar, Hurst and Karabarbounis (2013), the greater time at leisure for the non-employed constitutes more than half of the time accounted for by their reduced hours at market work compared to those employed. Second, the employed experienced an increase in leisure since 2004, primarily driven by falling hours spent on home production. This decline in home production time continues a trend that started in the 1960s. Of the increase in leisure for the employed, half occurred in sleep/eating/personal care, while the other half occurred in computer time. As with the results above combining employed and not employed, the bulk of the increase in computer time was due to video game playing. Turning to those not employed, we see that average leisure hours actually fell since 2004. This likely partly reflects a composition shift in the pool of non-employed, as they now constitute a much bigger share of these young men. It is partly driven by a, perhaps related, large increase in education time for non-employed LEYM.

Finally, and most notably, we see that, for non-college young men who are not employed, leisure spent on computer time increased by a dramatic 6.5 hours per week. (This is despite leisure hours falling on average for this goup.) Most of this increase, 5.2 hours out of the 6.5, can be attributed solely to increased video game playing. Thus, there was a dramatic shift in the composition of leisure towards computer/video games for this group. In 2012, LEYM without a job allocated 12 hours a week to computer use. This is more than they spend on education, socializing, exercise/sport and other leisure categories. Aside from TV/movie watching, computing and gaming are the primary leisure activity of these less educated young men without a job.

The time diaries only record activities from one day. Most individuals do not report spending time on that many activities during one given day. For example, even for the sample of non-working, non-college young men, 67 percent report no computer time during the prior day for 2011-2014. However, those who do report computer time spend a lot of time on that activity. For 2011-2014, conditional on having computer time, the average time spent that day was 3 hours.

Table 8 shows the amount of time spent on computers, and video games in particular, for other demographic/schooling groups in 2004-2007 and 2011-2014. The group that spends the second most time with computer and video gaming during 2011-2014 were young college men. On average, these men spent 4.7 hours per week on the computer, with half that (2.3 hours) spent on video games. Computer and video game time is an activity primarily engaged in by young men. To further illustrate this point, we compute the total amounts of video game time and computer usage across all individuals ages 21-55, pooling the 2011-2014 samples of the ATUS. We then ask what share of total time on these activities is done just by young men. Young men constituted 47 percent of all video game time and 31 percent of all computer time among all persons ages 21-55. These numbers are striking given that young men comprise only 14 percent of that population. Young non-college men, alone, account for 39 percent of video game time and 24 percent of computer time, despite a population share of only 10 percent.[29]

[29] We also examined the amount of video game time in 2011-2014 played by 15-20 year old boys relative to 15-20 year old girls. Boys played three times as much video games and allocated twice as much time to computers than girls at these ages.

8 Estimating Leisure Luxuries

Can large declines in the relative price of computers and video games affect the labor supply of younger men? The theory in Section 6 outlines how the labor supply response to innovation in a leisure activity will be amplified if that activity is a leisure luxury, that is, exhibits small diminishing returns. In this section we estimate the extent to which goods differ in diminishing returns by estimating their leisure Engel curves. We are particularly interested to see if time spent in computer and video gaming is a leisure luxury, given it has been subject to such rapid technology change.

Recall that whether an activity is a luxury or not depends on its inter-temporal elasticity. Specifically, in Section 6, we showed that with iso-elastic and additive separability:

$$\frac{d \ln h_i}{d \ln H} = \frac{\eta_i}{\epsilon}.$$

That is, the slope of an activities Engel curve is given by its own elasticity relative to the weighted average of all elasticities. We denote the slope by β_i:

$$\beta_i \equiv \frac{\eta_i}{\epsilon}.$$

Note that β_i is not a constant parameter, unless all activities have the same η_i. Otherwise, Engel curves must be inherently nonlinear, as the activity with the highest η_i must eventually dominate and its slope converge to one. In our estimation, we use a linear specification, which can be considered a first-order approximation around the sample's average level of total leisure.

We estimate the leisure demand system using average time spent on each activity at the state level. Given that time diaries cover only one day, an individual's time diary will contain many zeros, even though the respondent likely spends time on that activities over the course of a week or month. We address this issue by aggregating over individuals in a state and time period. Given the small sample at the state level, we pool across four years. This gives us three time periods: 2003-2006, 2007-2010, and 2011-2014.[30]

Let h_{ikt} denote average time devoted to activity i in state k and time period t. Let $H_{kt} = \sum_i h_{ikt}$. Our empirical specification is:

$$\ln h_{ikt} = \alpha_{ik} + \alpha_{it} + \beta_i \ln H_{kt} + \varepsilon_{ikt}. \tag{9}$$

We include both time period fixed effects, α_{it}, and state fixed effects, α_{ik}. This specification is estimated separately for each activity i, and hence all intercepts are also activity-specific. Moreover, we estimate (9) separately for each sub-population we report, and so allow all parameters to vary across education and age groups as well. We weight the states by the number of observations in the state during the first time period. This minimizes the impact of smaller states that have few observations. We also explore additional specifications which include additional controls at the state-time level.

This specification embeds an assumption regarding how the θ_i vary. Specifically, we assume that θ_i shift uniformally for all agents across states, and hence will be absorbed (to a first order) in the time fixed effect. In the case of computers and video games, the assumption of common technology seems justifiable, given the widespread and rapid diffusion of these technologies during the 2000s throughout the US.[31] Note, our specification does allow for different preferences for leisure activities across states (α_{ik}). However, we maintain that these preference differences are fixed over time.

The residual term in (9) captures idiosyncratic (at the state-time level) variation in preferences for particular activities. The identifying assumption is that these are uncorrelated with total leisure time. In particular, we are assuming that these taste shocks average out over activities such that they do not shift the choice of total leisure time. This embeds

[30] Our strategy here follows Aguiar, Hurst and Karabarbounis, 2013, who provide further discussion.

[31] We tried to find regional variation in the availability of high speed internet technology to use as a potential instrument for computer access. However, according to reports from the FCC, all MSAs had at least some individuals with high speed internet as far back as 2000.

the assumption regarding a common θ_i. As a robustness, we will instrument for aggregate leisure, as discussed below.

Table 9 shows our estimates of β_i using data for young men. We examine six broad leisure categories: total computer, TV/movies, socialization, exercise/sport, eating/sleeping/personal care, and other leisure. We further break total computer time into two sub-categories: video games and other computer. The two columns of Table 9 employ different specifications. The first includes time fixed effects while the second includes both time and state fixed effects. Standard errors are clustered at the state level. Estimates of $\beta_i > 1$ indicate goods that are leisure luxuries.

As seen from Table 9, computers and video games are leisure luxuries. Focusing on the results in column 1, the estimate of β for computers for young men is 2.15 (with standard error 0.58). All other time-use categories have estimates of β below 1.3. TV/Movie watching has an estimated leisure elasticity of 1.3, while exercise/sport has an estimated elasticity close to 1.2. Neither are statistically different than 1. Socializing, other leisure, and eating/sleeping/personal care all have estimates of β less than 1. The estimates are nearly identical between columns 1 (no state fixed effects) and column 2 (with state fixed effects) suggesting that tastes for activities do not differ markedly across states, at least not in a fashion correlated with total leisure in that state. However, the estimates with state fixed effects have larger standard errors reflecting that only within state variation is being used.

Breaking computer use into two sub components - video games and all other computer use - shows that video games has the highest elasticity at 2.5 while other computer use has an elasticity of 1.9. The point estimates suggest that video game time is the most luxurious leisure; but, given the standard errors on the estimates, one cannot rule out that the two sub-categories have the same elasticity.

Table 10 shows the estimates of β for total computer use for other groups. β for computers is nearly identical for both young non-college men (column 1) and young college men (column 2). The estimates are 2.2 and 1.8, respectively. The fact that the two estimates are similar justifies us pooling together the two groups for the results in Table 9. For non-college young women (column 3) and non-college older men (column 4) the estimates of β for computer use is close to 1. This is not surprising given that young women and older men spend little time playing video games and spend much less time on the computer than young men. In sum, our estimates yield that computer use in general, and video game playing in particular, is a leisure luxury for young men, but not for other groups.

We performed various robustness specifications on the results in Tables 9 and 10. Most notably, we estimated a share-log specification instead of a log-log specification, regressing s_{ikt} on $\ln H_{kt}$. This specification mirrors the AIDS expenditure demand system of Deaton and Muellbauer (1980). The results remain very similar to our baseline results. As with the log-log specification, for young men the AIDS specification finds computer use to be a strong leisure luxury. (Its share coefficient on log total leisure, at 0.10 to 0.12, with standard error 0.03, is significantly above zero.) Furthermore, for young men, computer use again was estimated to be the most luxury leisure good. We focus on the log-log specification as our base case because it is a linear approximation whose coefficients are easily interpretable in our framework. However, it is reassuring that the AIDS specification yield very similar results.[32]

Finally, given potential concerns that differential changes in θ_i across states may confound our estimates of β_i, we pursue two additional identification strategies. First, we use state level movements in the employment of men 41-55 as a proxy for state level changes in leisure of young men. The identification assumption here is that relative state-level changes in θ for computer use are not correlated with relative shifts in labor supply or labor demand across states for 41-55 year old men. As shown in the prior section, middle-age men allocate little time to either (non-work) computer usage or video games. Instead, we are assuming that cross state variation in the employment of middle-age men is being driven by local labor

[32] As another robustness test, we experimented with alternate groupings of years; but the results do not appear sensitive to the choice.

demand shifts.[33] By isolating state-specific movements in total leisure time for young men that project on their state's movements in employment of older men, we are isolating changes in leisure for young men that are driven by changing local labor demand conditions.

Second, we focus purely on relative shifts in total leisure between non-college and college young men over time, and ask how these changes map to differential changes in computer use. The assumption here is that the preferences and technology of non-college men and college men are the same, at least with respect to computer and gaming leisure, so that changes in θ affect the two groups equally. Therefore, how the non-college group's computer time increases, vis a vis that for the college group, as its relative total leisure increases can identify the leisure Engel curve for computer usage.

Panel A of Table 11 implements our first alternate identification strategy. Using data from the 2007 and 2010 March CPS, we pool men ages of 41 to 55 by their state of residence each year. We then compute average hours worked for this group by state for both 2007 and 2010. We segment states into three groups based on the percentage change in work hours for 41-55 year old men during the 2007-2010 period of the Great Recession. The "high-declining work hours" states include the 17 states with the largest hours decline for older men, while the "low-declining work hours" states are the 17 states with the smallest hours decline for these men.[34] We next compute pre-recession versus post-recession leisure and computer time use for all men aged 21-30 (from the ATUS), stratifying by these same three state groupings. We can then relate state differences in the growth in young men's total leisure and computer use on how work hours declined for older men.

There are four columns in the top panel of Table 11. The first two columns refer to states with large hours decline for older men, while the third and fourth refer to states with small hours declines. The first and third rows show (log of) average leisure for young men

[33]Beraja, Hust, and Ospina (2016), Charles, Hurst and Notowidigdo (2016), and Mian and Sufi (2014) all conclude that declines in labor demand explain cross region variation in employment during the Great Recession.

[34]Although not shown, this segmentation of states also strongly predicts hours declines across states for young men. This is arguably consistent with most cross-state variation in hours for LEYM being driven by differential declines in labor demand.

within each state grouping, while the second and fourth rows show (log of) their average computer time. (Rows also reflect time periods for measuring time use.) States where hours declined most for older men are also the states where leisure time of young men most increased. Leisure time increased by 7 percent for young men in states with steep declines in work hours for older workers, but by only 2 percent for states with slightest declines in work hours. Computer time increased by 59 percent and 47 percent, respectively, for young men in the two state groupings. From this, we can compute the implied β, computer time's elasticity with respect to total leisure, to equal 2.6.[35] This is close to our baseline estimate for β of 2.15 from Table 9.

The bottom panel of Table 11 considers the second exercise, that of simply comparing young men's time use patterns (from the ATUS) across the two levels of schooling, college and non-college. The right two panels are for young non-college men, while left two are for young college men. Otherwise, the structure of panel B is similar to panel A. We show the results for 2011-2014 although the estimated β is nearly identical for the 2007-2010 period. Assuming that preferences for leisure are the same for college and non-college men, the relative differentials in computer time use versus that in total leisure across the two groups implies an elasticity, β, for computer use of 2.8.[36]

All of our identification strategies suggest that computer time is a leisure luxury for young men, with estimates of $\frac{\eta_i}{\epsilon}$ in the range of 2.0 to 2.5, or even perhaps a little higher. Given the large decline in relative price (increase in technology) that computers and video game time experienced since the early 2000s, theory suggests we should have expected an impact on the level and slope of the labor supply curve for young men. In section 8 below, we use our estimates of the leisure Engel curve for computer time to take a first pass at quantifying these effects.

[35] This reflects the differential change in computer time of 12 percent (from 0.59 minus 0.47) relative to the differential in total leisure time of 5 percent (from 0.07 minus 0.02).

[36] This reflects the differential of 31 percent ($1.86 - 1.55$) in computer use versus 11 percent ($4.18 - 4.07$) in total leisure.

9 Leisure Luxuries and Labor Supply During the 2000s

The estimated leisure Engel curves allow us to separately infer the relative shift in quality of different activities from changes in total time allocated to leisure. Given this methodology, we then can compute the changing incentives to consume leisure. We now perform a simple exercise that calculates how much the large shift in leisure time toward gaming/computer leisure may have contributed to the overall decline in market work for LEYM over the past decade. More exactly, we compare the pre-Great Recession years 2004-2007, to the post-recession years 2011-2014. While our focus are on LEYM, we provide calculation for all prime-age men (PAM) for comparison. In all calculations, we allow parameters to be group-specific, including the Engel curve elasticities and share parameters. We omit the group index on parameters in what follows to minimize notational clutter.

To perform this calculation, we use the benchmark framework from Section 6. Recall that activity I is the leisure activity with the greatest elasticity. From Section 8, this is gaming and computer use. We are interested in how the shift in the quality of this activity affected overall leisure. Recall from Section 6 equation (7) that the relevant elasticity holding consumption and wages constant is:

$$\left.\frac{d\ln H}{d\ln\theta_I}\right|_{c,w} = s_I\eta_I,$$

where $s_I = h_I/H$ is the share of leisure time devoted to activity I. Thus the impact on total leisure from a shift in I's technology is pinned down by I's share of total leisure and its curvature elasticity. The share devoted to gaming, s_I, is observable in the ATUS and reported above. The leisure Engel curve for I, estimated in Section 6, yields a value for $\frac{\eta_I}{\epsilon}$. Thus, we are able evaluate this elasticity conditional on a value for the leisure Frisch elasticity ϵ.

We stress that this is the labor supply response holding consumption, as well as the wage, constant. Section 6 also discussed a "hand-to-mouth" scenario, in which $c = w(1 - H)$, and so the changes in labor earnings affect consumption one-for-one. Recall from equation (8) that for a fixed wage, the elasticity is:

$$\left.\frac{d\ln H}{d\ln\theta_I}\right|_{c=w(1-H)} = \frac{s_I\eta_I}{1+\frac{\epsilon}{\rho}\left(\frac{H}{1-H}\right)}.$$

This additionally depends on the ratio of leisure to work time, $\frac{H}{1-H}$, and the ratio of leisure's to consumption's inter-temporal elasticity of substitution, given by ϵ and ρ, respectively. This additional term reflects that leisure involves foregone consumption, and thus there is an "income effect" that mitigates the overall change in leisure.

In both calculations, we hold the wage (for each group) constant. That is, they are predictions for labor supply, not quantity of labor supplied. To the extent increased leisure, caused by an increase in θ_I, drives up wage rates for these workers in equilibrium, that should induce another partial offset to leisure.

To map these elasticities with respect to θ_I to the predicted change in leisure requires an estimate on the change in θ_I over time. Recall that the first order conditions imply that for any activity i:

$$\frac{1}{\eta_I}\ln h_I - \frac{1}{\eta_i}\ln h_i = \ln\theta_I - \ln\theta_i.$$

Differencing over time and rearranging, we have:

$$\Delta\ln\theta_I = \frac{1}{\eta_I}\Delta\ln h_I - \frac{1}{\eta_i}\Delta\ln h_i + \Delta\ln\theta_i.$$

Taking a weighted average over all $i \neq I$, using shares out of non-gaming leisure as weights gives:

$$\Delta\ln\theta_I = \frac{1}{\eta_I}\Delta\ln h_I - \sum_{i=1}^{I-1}\left(\frac{s_i}{1-s_I}\right)\frac{1}{\eta_i}\Delta\ln h_i + \sum_{i=1}^{I-1}\left(\frac{s_i}{1-s_I}\right)\Delta\ln\theta_i.$$

The implied measure of θ_I depends on the relative time re-allocation towards I as well as the change in quality of non-gaming activities. As a normalization, we set $\sum_{i=1}^{I-1}\left(\frac{s_i}{1-s_I}\right)\Delta\ln\theta_i$ equal to zero, assuming that on average other leisure activities have not significantly changed from the mid 2000's to the early 2010's. We view this as conservative, as one important activity, television watching, clearly experienced nontrivial technological improvements. Making this assumption and rearranging yields:

$$\begin{aligned}\Delta\ln\theta_I &= \frac{1}{\eta_I}\left[\Delta\ln h_I - \sum_{i=1}^{I-1}\left(\frac{s_i}{1-s_I}\right)\left(\frac{\eta_I}{\eta_i}\right)\Delta\ln h_i\right] \\ &= \frac{1}{\eta_I}\left[\Delta\ln h_I - \Delta\Lambda_I\right],\end{aligned}$$

where the second line introduces the short-hand $\Delta\Lambda_I \equiv \sum_{i=1}^{I-1}\left(\frac{s_i}{1-s_I}\right)\left(\frac{\eta_I}{\eta_i}\right)\Delta\ln h_i$.

We can now derive an expression for the implied change in total leisure. Let $\Delta H_{c,w}$ be the predicted change in leisure holding consumption and wages constant:

$$\Delta H_{c,w} \approx \left.\frac{d\ln H}{d\ln\theta_I}\right|_{c,w}\Delta\theta_I = s_I\left[\Delta\ln h_I - \Delta\Lambda_I\right].$$

Notice that the implied change in leisure involves only observables (shares of leisure) and the estimated leisure Engel curves. In regard to the latter, as Λ_I depends only the *relative* elasticities η_I/η_i, we do not need to take a stand on the Frisch elasticity ϵ. Moreover, the implied change in θ_I is scaled by $1/\eta_I$, which exactly cancels with the fact that the elasticity of H with respect to θ_I is scaled by η_I.

The "hand-to-mouth" implied change in leisure, $\Delta H_{c=w(1-H)}$, is:

$$\Delta H_{c=w(1-H)} \approx \left.\frac{d\ln H}{d\ln\theta_I}\right|_{c=w(1-H)}\Delta\theta_I = \frac{\Delta H_{c,w}}{1+\frac{\epsilon}{\rho}\left(\frac{H}{1-H}\right)}.$$

In contrast to the constant-consumption calculation, this change requires taking a stand on $\frac{\epsilon}{\rho}$.

Before putting numbers into these expressions, we briefly review what our approach entails. The observed relative shift in time towards gaming and away from other leisure activities gives us a sense of how the quality of gaming has improved. In particular, we are using the shift that is not predicted by movements along the estimated Engel curves, and hence are attributing the unexplained part of the movement to quality changes in gaming (i.e., shifts in the Engel curves). Finally, given our estimates, and the implied total leisure elasticity, we can predict how much leisure should increase in response to the quality improvements in video games, all else equal.

Turning to the data, Table 12's first two columns report H and s_I for all prime-age men in the first row, then for LEYM in the second. These are Tornqvist averages of the values for each group for the 2004-2007 and 2011-2014 periods. Leisure constitutes half of the time endowment of 119 hours per week for PAM and 55 percent for LEYM.[37] Gaming/computer leisure constitutes 4.9 percent of leisure for PAM compared to 7.7 percent for LEYM. Columns 3 and 4 report the changes H and s_I for the two groups. Total leisure went up by 3.1 percent for PAM, but by 5.6 percent for LEYM. Gaming/computer's share grew considerably for both groups over this seven-year window–but by 48.4 percent for LEYM compared to 26.8 percent for PAM.

The fifth column provides the impact on leisure choice holding consumption and wages constant. These are sizable. For PAM, it is 1.4 percent, representing over 40 percent of the size of PAM's total leisure increase. For LEYM it is nearly three times larger, at 3.9 percent; that represents more than two-thirds of the increase in LEYM's leisure.

We now move to our variable of interest. Market hours fell more dramatically than our measures of total work, which also includes home production and schooling. Therefore, it is important to stress that these leisure changes represent a smaller share of the decrease in

[37] Recall that we subtract 49 hours for "non-discretionary" sleep and personal care. In work time we include market and market related activities–commuting, looking for work. We also include home production and time allocated to education. Home production is defined fairly broadly to include activities that substitute for purchased goods, including child care and care for other adults. The leisure categories correspond to those reported above. In addition we have added civic/religious activity (averaging 1.6 hours for PAM, 1.3 for LEYM) to social activities and we allocate a little over an hour of unclassified time between other leisure and work, so that it has no impact on H.

market hours for both groups.[38] If we assume that the increase in total leisure driven by gaming drew proportionately from market work and these other work activities, then the implied decline in market hours is 0.5 hours per week for PAM, but 1.6 hours for LEYM. Those number represent about one-fourth of the market hours decline for PAM (2.0 hours), and a little under half of the decline for LEYM (3.4 hours). Furthermore, the differential impact on LEYM of just over an hour constitutes more than 70 percent of their decline in market hours *relative* to PAM.

Without taking a stand on the leisure Frisch for these groups, we cannot break the predicted change in leisure between its components of $\Delta \ln \theta_I$ versus the group's responsiveness to θ_I. But in Column 6 we do this for illustration under the following set of assumptions. First, we set the leisure Frisch for PAM equal to 1. Given this group has an average H of 0.5, this also implies that their Frisch elasticity for hours worked –non-market and market– is also approximately 1. Second, we assume that the weighted average of η_i's outside of gaming/computer leisure, $\sum_{i=1}^{I-1} s_i \eta_i$, is the same for PAM and LEYM. This implies a Frisch elasticity for leisure for LEYM that averages 1.06 across the two periods. Given these assumptions, the implied change in θ_I for PAM is 22.2 percent (which is about 3 percent per year). For LEYM the implied change in θ_I is almost identical, at 24.1 percent. Thus the calculation yields essentially the same increase θ_I across the two groups, even though s_I increased at a much greater rate for LEYM. Our calculations attribute LEYM's much greater increase in s_I to their much steeper leisure Engel-curve slope for gaming/computer leisure.[39]

Conditional on the Frisch ϵ, it is also possible to map our leisure supply shifts into wage space, according to $\Delta \ln H_{c,w}/\epsilon$. For instance, keeping ϵ at 1.06 for LEYM, the drop in their desired labor due to $\Delta\theta_I$ is equivalent to that from a 3.5% decline in their wage rate.

As discussed above, the implied movements in total leisure are smaller if those partaking

[38]From the ATUS data, market hours for PAM fell by 5 percent from 2004-2007 to 2011-2014, compared to, essentially no change in the other work activities. For LEYM, market hours fell by 10 percent, while the other work activities fell by a little over 1 percent.

[39]This point does not depend on the choice of the absolute value of the Frisch. For instance, if set PAM's leisure Frisch to 0.5, instead of 1.0 (with the corresponding ϵ for LEYM going from 1.06 to 0.54), then $\Delta \ln \theta_I$ simply doubles for both groups.

cannot insulate their expenditures from the increased leisure. This is illustrated in the final column of the table assuming hand-to-mouth consumption and that each group has an inter-temporal elasticity for consumption equal to their Frisch elasticity for leisure. The predicted impact on leisure is cut by half for PAM, and by a little more than half for LEYM. Nevertheless, the impact on leisure is not trivial, comprising respectively for PAM and LEYM 22 and 31 percent of their total increases in leisure for this period. Likewise, our implications for market work hours would be cut by about half if individuals cannot insure their expenditure from the increased leisure. If individuals are hand to mouth, our Engel curve analysis suggests that improved leisure technology explains 13 percent of the decline in market hours of work for PAM, while explaining 21 percent for LEYM. In summary, the way individuals changed their allocation of time away from market work suggests that increased leisure technology reduced market work hours for LEYM by between 25 and 50 percent depending on assumptions made surrounding the ability of individuals to insure their consumption levels when not working. For all PAM, the increased leisure technology explains between 13 and 25 percent of the decline in market work hours. In presenting our wedge calculations above, we found that relative household expenditures for the LEYM households showed little decline relative to other households since 2000. This is suggestive that the LEYM have largely been able to insulate their consumption despite their increased leisure. For this reason, we believe the calculations above, holding consumption constant, may in fact be more relevant. Finally, our results show that other forces, including traditional stories of declining labor demand, could still potentially explain a bulk of the declining work hours for PAM and LEYM. However, the results in our paper suggest that increased technology in leisure activities also had an effect on declining work hours by affecting labor supply.

10 Happiness Data By Group During the 2000s

Before concluding, we show one last set of empirical facts. In this section, we use data from the General Social Survey (GSS) to examine trends in reported life satisfaction for young non-college men relative to other groups. The GSS is a nationally represented bi-annual survey that is designed to assess attitudes and beliefs of US residents. During the 2000s, each wave of the GSS has between 2,000 and 4,000 respondents.

As part of the GSS, respondents are asked to report their overall level of happiness. In particular, the survey has consistently asked individuals the following question: "Taken together, how would you say things are going these days – would you say that you are very happy, pretty happy, or not too happy?" We create a happiness index that takes the value of 1 if individuals report that they are either "very happy" or "pretty happy," and takes value 0 otherwise. As with the ATUS, we pool together waves of the GSS in constructing our happiness index over time given the survey's modest sample size. We examine three time periods: 2001-2005 (which includes the 2002 and 2004 waves), 2006-2010 (which includes the 2006, 2008, and 2010 waves), and 2011-2015 (which includes the 2012 and 2014 waves).

Table 13 tracks the trends in happiness for different demographic groups since the early 2000s. Over this time, the happiness of young non-college men actually increased by 7 percentage points (from 81 percent to 88 percent). Despite the small sample sizes, this increased share reporting they are very or pretty happy is statistically significant at the 5 percent level. So, in conjunction with the steep decline in their employment rate, reported life satisfaction has increased for these men. Furthermore, among young non-college men, both the employed and non-employed exhibit an increase in their happiness indices over time.

Over the same time period, reported happiness of young non-college women and young college men has remained roughly constant. Again, this occurred despite falling employment rates for both groups. The patterns of young individuals stand in stark contrast to older workers. Table x also documents that happiness fell sharply for older non-college men since the early 2000s. This group has experienced a large declines in work hours as well. In the early 2000s, older non-college men reported being happier on average than did younger non-college men. By the 2011-2015 period, that relationship had flipped. The deterioration of measures of well being of older workers has been studied recently by Case and Deaton (2015). Our work adds to this literature by showing that, over the last 15 year, young non-college individuals experienced no decline in happiness, in contrast to older workers. In fact, their happiness index has risen.

While by no means conclusive, these results are consistent with computer technology broadly, and video games in particular, increasing the value of leisure time for younger workers. Put differently, we should suspect important forces, beyond reduced demand for their labor services, have affected the choices and well-being of young non-college men, as a decline in demand for one's labor should be no source of cheer.

11 Conclusion

Since 2000 hours worked for prime-age men (PAM), those aged 21 to 55, have fallen significantly, but this decline has been especially severe for less educated young men (LEYM). For an explanation we first look to standard substitution and wealth effects by examining the labor supply wedge for LEYM. But LEYM's hours movements are mirrored in their wedge, as they exhibit neither a significant relative fall in wages nor a significant relative rise in consumption. This is one motivation to look beyond the labor market for an explanation LEYM's hours worked. A second are the dramatic changes we see since the early 2000's in LEYM's choices for non-market time. For instance, just from 2004-07 to 2011-14, while market hours worked by LEYM fell by 10%, their time in home production fell by 15%. This suggests that that activities other than work, both at home and in the market, have become more attractive.

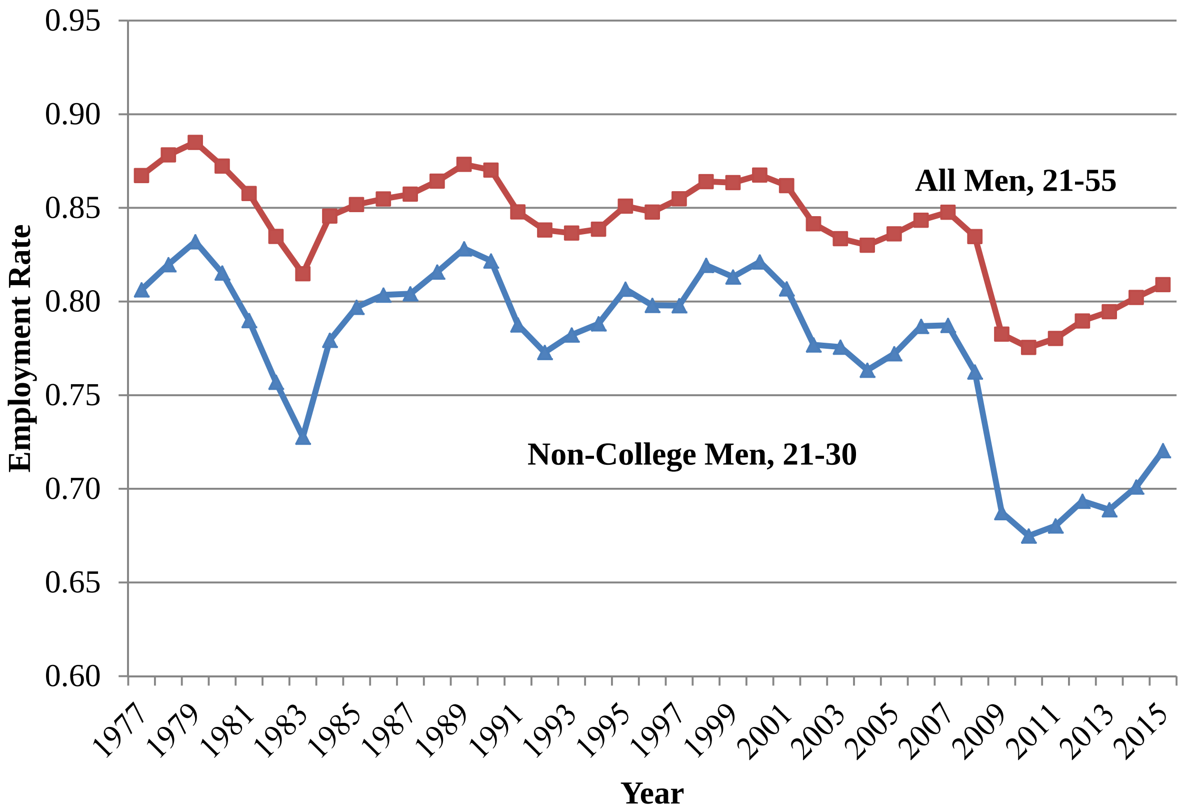
By modeling a leisure demand system for individuals, we show that innovations to leisure technology have much bigger impact on labor supply if they hit leisure luxuries, activities with little diminishing returns. Our candidate activity is computer leisure and gaming. LEYM increased time in that activity by 70 percent over a seven-year window before and after the Great Recession. We estimate leisure Engel curves demand based on our model of leisure demand, finding that computer leisure and gaming exhitit far and away the steepest leisure Engel curve for LEYM. A natural question is whether LEYM are spending more time gaming because they are working less, or working less because they age gaming. To address this, we exploit our leisure Engel Curves estimates. These imply that, while both forces were at work, most of the increased an gaming and computer use reflects a shifting in leisure demand curves that will cause LEYM to take more total leisure. Our calculations suggest that innovations in gaming and computer leisure had a substantial impact on LEYM's labor supply, explaining perhaps as much as two thirds of their increase in leisure time and 45 percent of their decline in market hours.

The impact of leisure technology on LEYM' labor supply depends on how well these young men can insulate their consumption from the loss in earnings. For instance, our calculation that increased gaming/computer time can explain 45 percent of LEYM's decline in market hours is cut by over half if we assume LEYM consume hand to mouth. But notice the same remark applies to labor demand shocks–in fact, for our calibration, a decline in LEYM's labor demand, consuming hand-to-mouth, leaves their market hours unaffected due to a strong wealth effect against leisure. More importantly, we find that household expenditures for LEYM's households did, in fact, show little decline relative to other households since 2000. This suggests these young men have been largely able to insulate their consumption against their decreased earnings. This could reflect borrowing, because they view their gaming prime as transitory, or transfers from family and others. From the perspective of a utilitarian parent, there is reason to insure a child's income loss caused by better leisure options, just as there would be to insure that loss from worse labor market options.

References

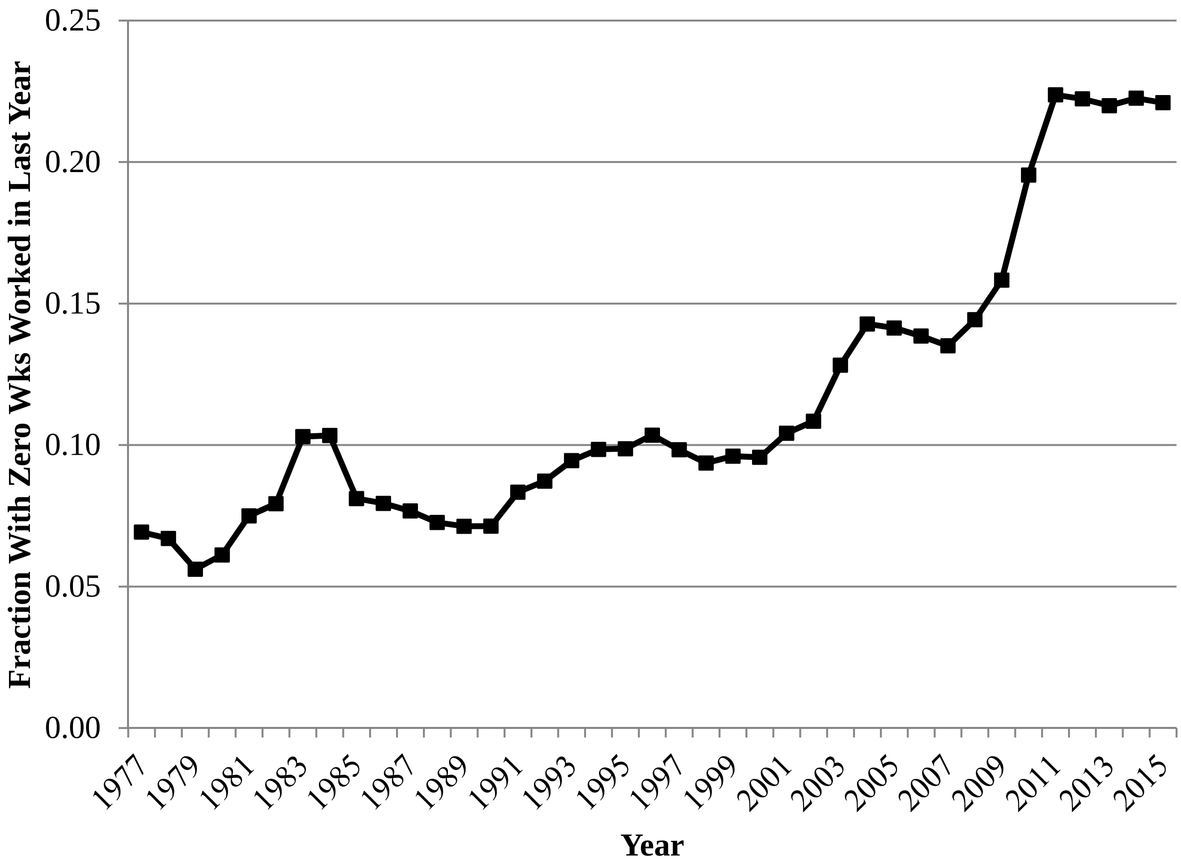
To be added...

Figure 1: Employment Rates for Prime Age Men and Young Non-College Men Over Time, March CPS



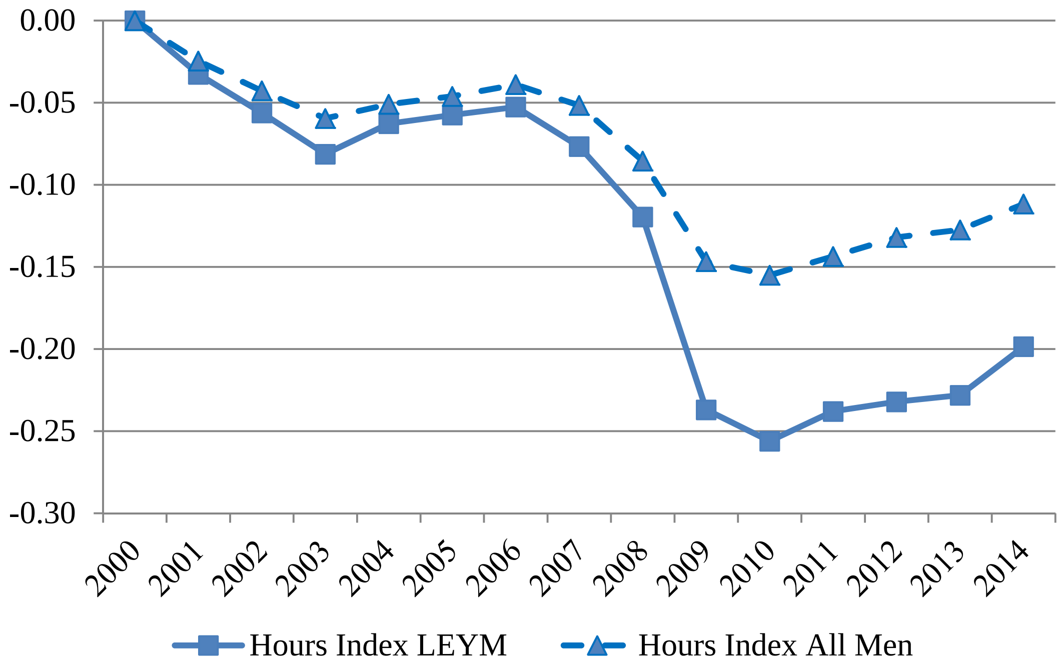
Notes: Figure shows the employment rate of all men between the ages of 21-55 (inclusive) and the employment rate of non-college men between the ages of 21 and 30 (inclusive). Non-college refers to individuals with less than a bachelor's degree. Data from the March supplement of the Current Population Survey.

Figure 2: Fraction of Young Non-College Men Who Report Working Zero Weeks During the Prior Year, March CPS



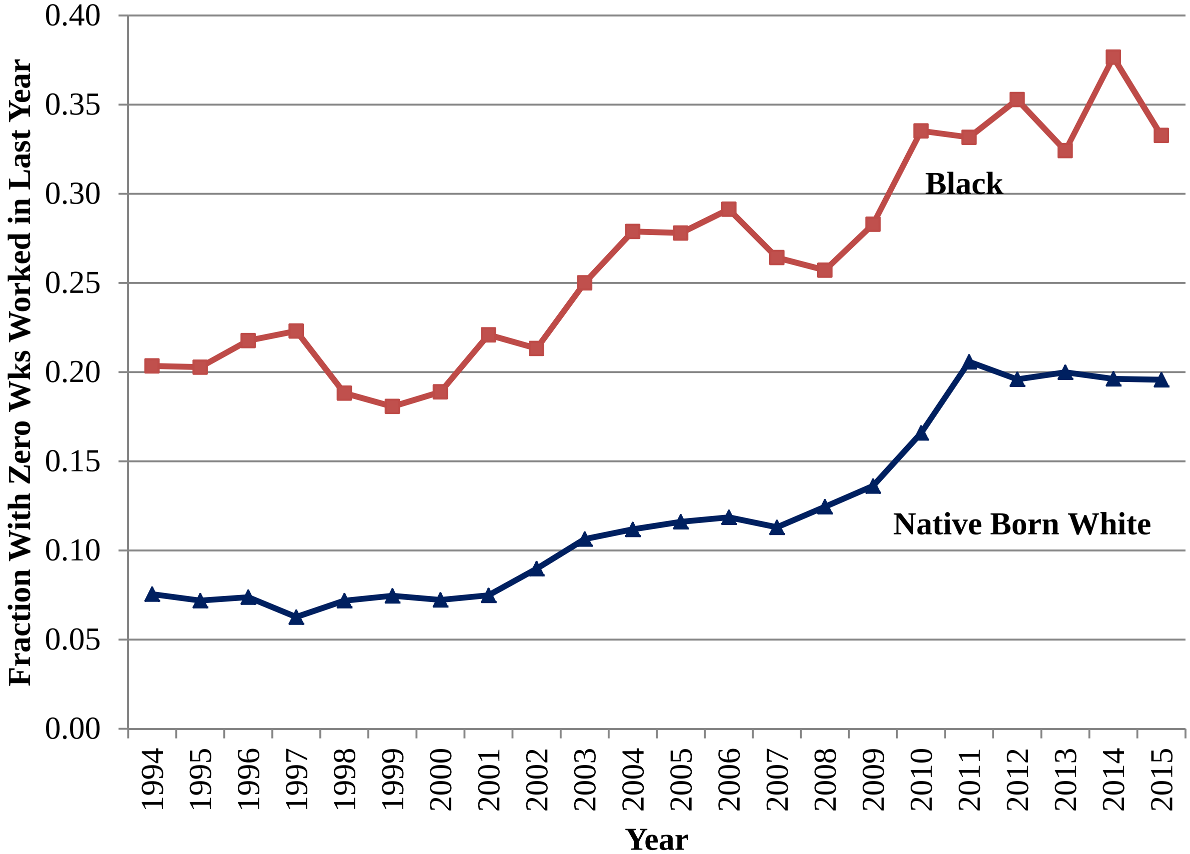
Notes: Figure shows the share of non-college men aged 21-30 who report working zero weeks during the prior year. Non-college refers to individuals with less than a bachelor's degree. Data from the March supplement of the Current Population Survey.

Figure 3: Annual Hours Index for Less Educated Young Men and All Prime Age Men, March CPS



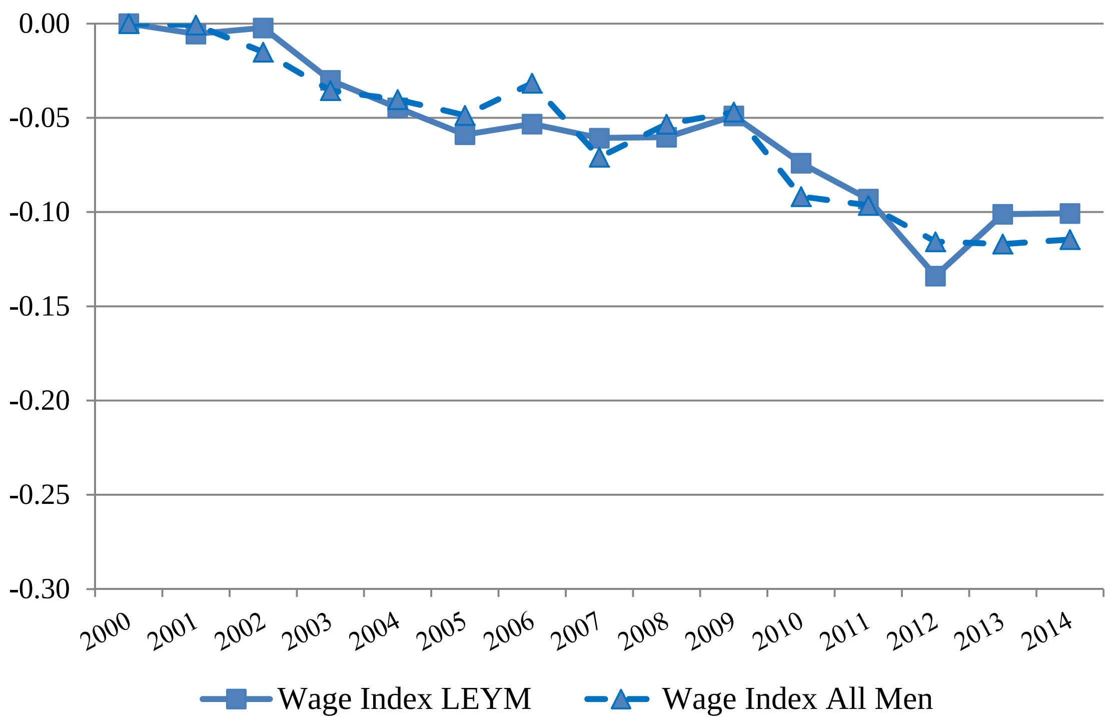
Notes: Figure shows annual hours index for lower educated young men (squares) and all prime age men (triangles). Annual hours are calculated by multiplying self-reported weeks worked last year by self-reported usual hours worked per week last year. We convert the series to an index by setting year 2000 values to 0. All other years are log deviations from year 2000 values. Data from the March supplement of the Current Population Survey.

Figure 4: Fraction of Young Non-College Men Who Report Working Zero Weeks During the Prior Year By Race, March CPS



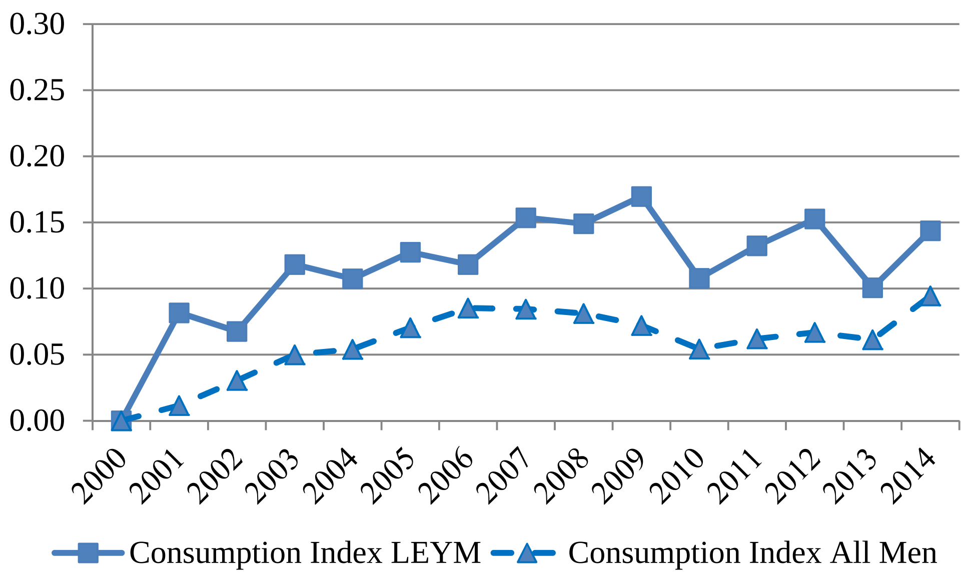
Notes: Figure shows the share of non-college men aged 21-30 who report working zero weeks during the prior year by race. Non-college refers to individuals with less than a bachelor's degree. We show the series for individuals who report their race as black (squares) and for individuals who report their race as white and who report being born in the United States (triangles). Data from the March supplement of the Current Population Survey.

Figure 5: Hourly Wage Index for Less Educated Young Men and All Prime Age Men, March CPS



Notes: Figure shows hourly wage index for lower educated young men (squares) and all prime age men (triangles). Hourly wages are reported as annual earnings last year divided by annual hours worked last year. We only calculate hourly wages for individuals with a strong attachment to the labor force. See text for additional details. We convert the series to an index by setting year 2000 values to 0. All other years are log deviations from year 2000 values. Data from the March supplement of the Current Population Survey.

Figure 6: Consumption for Less Educated Young Men and All Prime Age Men, BEA and Consumer Expenditure Survey Data

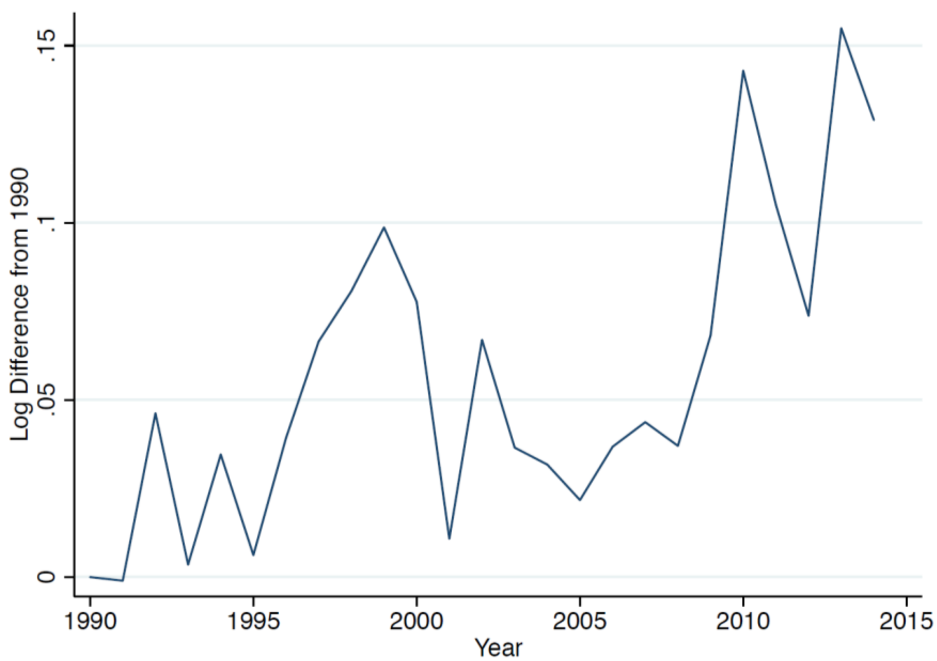


Notes: Figure shows the time series profile of real per-capita consumption (from NIPA and CE data) for less-educated young men (squares) and all prime age men (triangles). See text for details on the construction of our consumption measures.

Figure 7: Estimated Labor Wedge

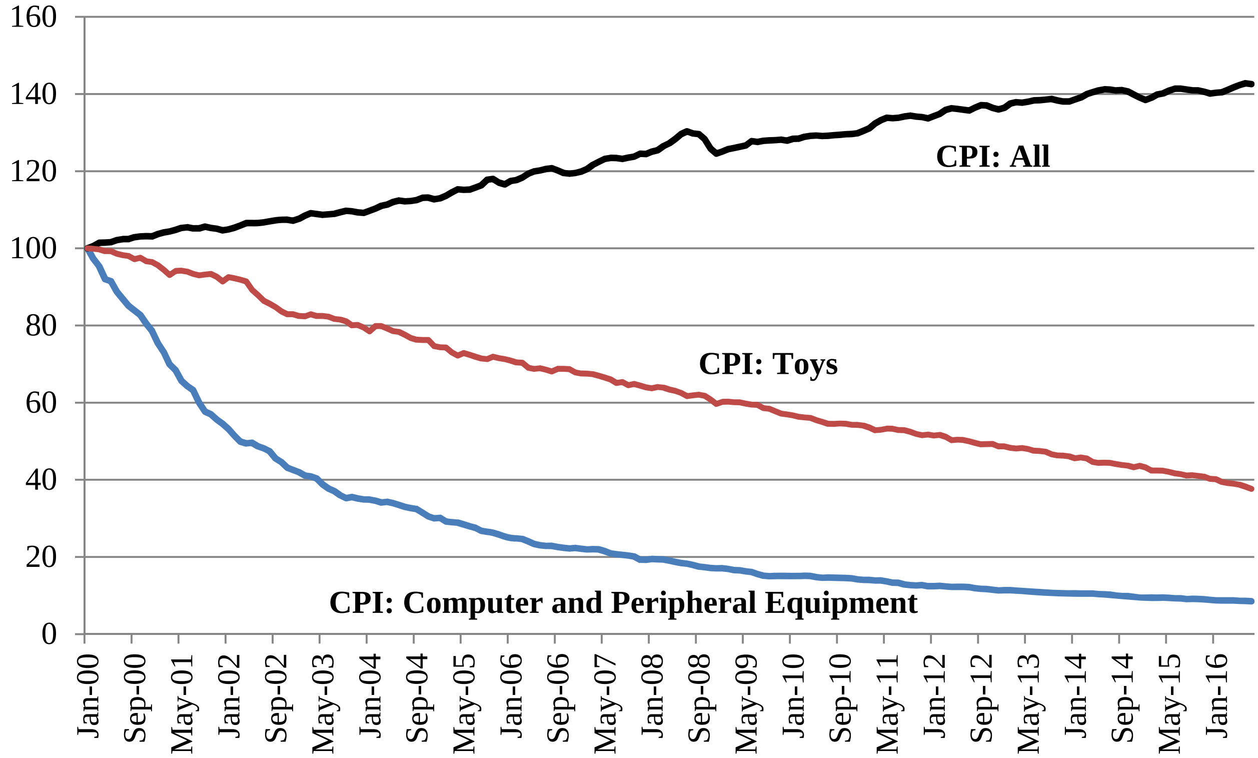
Panel A: All Men 21-55

Panel B: Less Educated Young Men Relative to All Men 21-55



Notes: Panel A of figure shows the estimated labor wedge for all men 21-55. Panel B of figure shows the estimated labor wedge of LEYM relative to all men 21-55. See text for details of the labor wedge calculation.

Figure 8: Price Index of Computer and Peripheral Equipment, Toys, and Composite CPI During the 2000s



Notes: Data from BLS.

Table 1: Annual Hours Worked By Age-Sex-Skill Group During the 2000s, March CPS

Panel A: Non-College Individuals

	Men		Women	
	21-30	31-55	21-30	31-55
2000	1,698	1,948	1,233	1,394
2007	1,616	1,877	1,136	1.353
2010	1,344	1,673	1,040	1,272
2015	1,397	1,751	1,032	1,242
Hours/Week Change 00-15	-301	-198	-201	-150
% Change 00-15	-19.5%	-10.7%	-17.8%	-11.5%

Panel B: College Individuals

	Men		Women	
	21-30	31-55	21-30	31-55
2000	1,938	2,284	1,642	1,638
2007	1,852	2,212	1,587	1,573
2010	1,707	2,111	1,516	1,565
2015	1,736	2,132	1,508	1,611
Hours/Week Change 00-15	-202	-152	-134	-37
% Change 00-15	-11.0%	-6.9%	-8.5%	-1.6%

Notes: Table shows annual hours worked from the 2000, 2007, 2010, and 2015 CPS. Annual hours are calculated by multiplying self-reported weeks worked last year by self-reported usual hours worked per week last year. Hourly wages are reported as annual earnings last year divided by annual hours worked last year. Non-college refers to individuals with less than a bachelor's degree while college refers to those with a bachelor's degree or more.

Table 2: Employment and Full Time Schooling Rates for Young Men and Women

Panel A: Age 21-24, March CPS

	Non-College Men		Non-College Women	
	Fraction Employed	Fraction Employed or Full Time School	Fraction Employed	Fraction Employed or Full Time School
2000	0.76	0.89	0.67	0.77
2007	0.73	0.86	0.63	0.76
2010	0.60	0.77	0.55	0.72
2015	0.63	0.81	0.59	0.76
Change 00-15	-0.13	-0.08	-0.08	-0.01

Panel B: Fraction Employed or in School Full Time, Age 21-30, October CPS

	Non-College Men	Non-College Women	College Men	College Women
2000	0.89	0.73	0.95	0.88
2007	0.86	0.72	0.94	0.89
2010	0.79	0.69	0.91	0.87
2014	0.83	0.70	0.91	0.86
Change 00-14	-0.06	-0.03	-0.04	-0.02

Notes: Panel A uses data from the March CPS to measure employment rates and employment plus full time schooling rates for non-college men and women. In all years during the 2000s, the March CPS tracked the schooling status of individuals up through the age of 24. The employment plus full time schooling column includes anyone who reports being employed or reports attending college full time. Panel B uses data from the October Educational Supplement of the CPS to measure the employment plus full time schooling rate for all individuals 21-30.

Table 3: Time Use Change (in Hours Per Week) for Broad Time Use Categories during the 2000s for Different Age-Sex-Skill, American Time Use Survey

	Non-College Men 21-30	Non-College Women 21-30	College Men 21-30	Non-College Men 31-55
Market Work	-3.44	-3.06	-2.91	-2.16
Home Production	-1.75	-1.22	-0.03	-0.16
Child Care	0.13	-0.56	-0.75	0.42
Education	1.19	0.88	1.49	0.02
Leisure	3.40	2.49	1.38	0.93

Notes: Table shows the change in time use for different age-sex-skill groups by major time use category between 2004-2007 and 2011-2014. To increase sample sizes, we pool together data from the 2004-2007 ATUS and then pool together data from the 2011-2014 ATUS. The table shows the difference between the two pooled samples for different age-sex-skill groups (in hours per week).

Table 4: Cohabitation Patterns for Young Non-College Men, American Community Survey

	Living with Parent/Step-Parent	Living with Parent or Other Non-Spouse Relative
2000	0.28	0.35
2007	0.32	0.41
2010	0.37	0.46
2014	0.41	0.51
Change 00-14	0.13	0.16

Notes: Table shows the fraction of non-college men age 21-30 cohabitating with their parents/step-parents (column 1) or any non-spouse relative including parents (column 2). Non-college refers to individuals with less than a bachelor's degree. Data come from the American Community Survey.

Table 5: Cohabitation Patterns for Non-College Young Men by Employment Status, Pooled 2011-2014 American Community Survey Data

	Employed	Non-Employed
Head, Not Married	0.20	0.10
Head/Spouse, Married	0.22	0.07
Live with Parent/Step Parent	0.32	0.56
Live with Other Relative	0.09	0.13
Live with Partner/Friend	0.13	0.09
Live with Other Non-Relative	0.04	0.04

Notes: Table shows the fraction of non-college men age 21-30 for different cohabitation arrangements by employment status. Non-college refers to individuals with less than a bachelor's degree. Data come from the American Community Survey.

Table 6: Hours per Week of Leisure Time By Category for Non-College Men 21-30, American Time Use Survey

	Pooled 2004-2007	Pooled 2011-2014	Change
Total Leisure	62.9	66.3	3.4
Adj. Eating/Sleeping/P. Care	24.4	25.4	1.0
Total Computer Time	3.7	6.4	2.7
Video Game	2.3	4.4	2.1
TV	18.3	18.1	-0.2
Socializing	8.1	8.1	0.0
Exercise/Sport	3.7	3.8	0.1
Other Leisure	4.8	4.4	-0.4

Notes: Table shows the average hours per week spent in various leisure activities for non-college men between the ages of 21 and 30. The sub-components of leisure sum to total leisure time. The first column shows data pooled over the 2004 through 2007 waves of the American Time Use Survey. The second column shows data pooled over the 2011-2014 waves. See the text for a discussion of the various leisure categories. Video game time is a subcomponent of total computer time.

Table 7: Hours per Week of Leisure Time By Category for Non-College Men 21-30, By Employment Status, American Time Use Survey

	Employed			Non-Employed		
	2004-2007	2011-2014	Change	2004-2007	2011-2014	Change
Total Leisure	58.1	60.9	2.8	89.0	84.0	-5.0
Adj. Eating/Sleeping/P. Care	23.1	24.7	1.6	31.0	28.0	-3.0
Total Computer Time	3.4	4.7	1.3	5.7	12.2	6.5
Video Game	2.1	3.2	1.1	3.4	8.6	5.2
TV	16.6	16.3	-0.3	27.6	24.0	-3.6
Socializing	7.5	7.7	0.2	11.0	9.7	-1.3
Exercise/Sport	3.2	3.5	0.3	6.1	4.7	-1.4
Other Leisure	4.3	4.0	-0.3	7.5	5.5	-2.0

Notes: Table shows the average hours per week spent in various leisure activities for non-college men between the ages of 21 and 30 by employment status. The sub-components of leisure sum to total leisure time. The first column shows data pooled over the 2004 through 2007 waves of the American Time Use Survey. The second column shows data pooled over the 2011-2014 waves. See the text for a discussion of the various leisure categories. Video game time is a subcomponent of total computer time.

Table 8: Computer Time and Video Game By Age-Sex-Skill Groups During the 2000s, American Time Use Survey

	(1) Pooled 2004-2007	(2) Pooled 2011-2014	(3) Diff (3)-(2)
College Men, 21-30			
Total Computer	2.85	4.69	1.84
Video Games	1.26	2.28	1.03
Non-College Men, 31-55			
Total Computer	2.09	2.12	0.04
Video Games	1.04	0.89	-0.15
All Men, 21-55			
Total Computer	2.50	3.37	0.87
Video Games	1.22	1.69	0.46
Non-College Women, 21-55			
Total Computer	1.61	2.42	0.81
Video Games	0.93	0.84	-0.10
All Women, 21-55			
Total Computer	1.62	2.19	0.56
Video Games	0.63	0.70	0.07

Notes: Table shows the average hours per week spent in computer time and video game time by various age-sex-skill groups. The first column shows data pooled over the 2004 through 2007 waves of the American Time Use Survey. The second column shows data pooled over the 2011-2014 waves. Video game time is a subcomponent of total computer time.

Table 9: Estimates of Leisure Engel Curves by Leisure Category, All Men Age 21-30, American Time Use Data

	Specification	
	(1)	(2)
Total Computer	1.94	1.91
	(0.61)	(0.78)
Video Games	2.22	1.73
	(0.73)	(1.15)
Other Computer	2.03	1.70
	(0.56)	(1.10)
TV	1.28	1.16
	(0.12)	(0.22)
Socializing	0.88	1.16
	(0.42)	(0.37)
Exercise/Sport	1.18	1.07
	(0.57)	(0.60)
Eat/Sleep/P. Care (adjusted)	0.64	0.56
	(0.18)	(0.18)
Other Leisure	0.93	1.00
	(0.31)	(0.57)
Time Fixed Effects	Yes	Yes
State Fixed Effects	No	Yes
Number of Obs.	150	150

Notes: Table shows the results of a regression of log of average time spent on various leisure categories by young men on the log of average total leisure for young men. Each observation is a state-year cell. We aggregate the data to three time periods: 2003-2006, 2007-2010, and 2011-2014. We weight the state regressions by the number of observations within each state. The first column only includes time fixed effects while the second column includes both time and state fixed effects. Standard errors clustered at the state level are reported in parentheses. See the text for additional details.

Table 10: Estimated Computer Time Engel Curve by Age-Sex-Skill Groups, American Time Use Survey

	Non-College Men 21-30	Non-College Women 21-30	College Men 21-30	Non-College Men 31-50	All Men 21-55
Total Computer	2.09	1.10	1.67	0.88	1.22
	(0.59)	(0.67)	(0.54)	(0.52)	(0.52)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	No	No	No	No
Number of Obs.	150	150	150	150	150

Notes: Table shows the results of a regression of log of average time spent on various leisure categories by young men on the log of average total leisure for young men. Each observation is a state-year cell. We aggregate the data to three time periods: 2003-2006, 2007-2010, and 2011-2014. We weight the state regressions by the number of observations within each state. The first column only includes time fixed effects while the second column includes both time and state fixed effects. Standard errors clustered at the state level are reported in parentheses. See the text for additional details.

Table 11: Alternate Estimates of Computer Time Engel Curves for Young Men

Panel A: Cross-State Variation Based on Employment Decline of Older Men

	Large Hour Decline States for Older Men		Small Hour Decline States for Older Men	
	Log Average Leisure Time	Log Average Computer Time	Log Average Leisure Time	Log Average Computer Time
2004-2007	4.11	1.22	4.11	1.26
2011-2014	4.18	1.81	4.13	1.73
Difference	0.07	0.59	0.02	0.47

Panel B: Cross Education Group Variation, Young Men

	Young Non-College Men		Young College Men	
	Log Average Leisure Time	Log Average Computer Time	Log Average Leisure Time	Log Average Computer Time
2011-2014	4.18	1.86	4.07	1.55

Notes: Alternate estimates of the computer time Engel Curve for young men. See text for details.

Figure 12: Impact of Computer and Gaming Technology on Growth in Leisure for Prime-Age Men vs. YLEM from 2004-2007 to 2011-2014

	(1) H	(2) dH/H	(3) s_l	(4) ds_l/s_l	(5) Impact on Leisure	(6) $d\theta_l/\theta_l$	(7) Impact if Hand-to Mouth
Prime-age Men (ages 21-55)	0.50	3.1%	0.049	26.8%	1.4%	22.2%	0.7%
YLEM	0.55	5.6%	0.077	48.4%	3.9%	24.1%	1.7%

Notes: Column (6) assumes Frisch elasticity for prime-age men and YLEM of 1.0 and 1.08, respectively. Column (7) assumes intertemporal elasticity in consumption equal to the leisure Frisch elasticity.

Table 13: Reported Happiness During the 2000s for Different Age-Sex-Skill Groups, General Social Survey

	Fraction Reporting "Very Happy" or "Pretty Happy"				
	(1) Pooled 2001-2005	(2) Pooled 2006-2010	(3) Pooled 2011-2015	(4) Diff (3)-(1)	(5) p-value of difference
Non-College Men, 21-30	0.813	0.828	0.881	0.068	0.048
	(n=193)	(n=372)	(n=244)		
College Women, 21-30	0.828	0.808	0.853	0.025	0.471
	(n=192)	(n=489)	(n=272)		
College Men, 21-30	0.929	0.926	0.919	-0.009	0.835
	(n=56)	(n=135)	(n=99)		
Non-College Men, 31-40	0.885	0.857	0.834	-0.051	0.143
	(n=182)	(n=384)	(n=241)		
Non-College Men, 41-55	0.881	0.812	0.799	-0.082	0.008
	(n=244)	(n=659)	(n=353)		

Notes: See text for details.